The Journal

OF THE

AMERICAN ASSOCIATION OF NURSE ANESTHETISTS

CONTENTS

OPINION REVIEW
"Night Call" and Obstetric Anesthesia 224

EDITORIAL
Bylaws Are Necessary 229

ANESTHESIA FOR SURGICAL PROCEDURES FOR INTESTINAL OBSTRUCTION 230
John A. Paulson, M.D.

FLUID ADMINISTRATION FOR THE SURGICAL PATIENT 237
A. R. Curreri, M.D.

GERIATRIC ANESTHESIA 244
Shirley M. Gillette, R.N.

MECHANISMS PRECIPITATING TERMINAL CARDIOVASCULAR AND RESPIRATORY FAILURE IN THORACIC SURGERY With Case Report 251
Barbara Van Arnam, R.N.

ANESTHESIA FOR THE PSYCHOTIC PATIENT 256
Gertrude L. Fife, R.N.

AN ANALYSIS OF ANESTHESIA SERVICE IN THE UNITED STATES FOR 1949 261
Virginia S. Thatcher, B.S., and Myra Van Arsdale, R.N.

PSYCHIATRIC ASPECTS OF ANESTHESIA 270
F. Gordon Pleune, M.D.

NOTES 279

LEGISLATION 280

THE NEWS 281

ABSTRACTS 286

BOOK REVIEWS 292

VOLUME XVIII • NOVEMBER, 1950 • NUMBER FOUR

TOOLS OF THE OPERATING TEAM
CYCLOPROPANE
PURITAN MAID
MEDICAL GASES
OXYGEN • NITROUS OXID
ETHYLENE • CYCLOPROPANE
CARBON DIOXID • HELIUM
Mixtures of HELIUM-OXYGEN
and CARBON DIOXID-OXYGEN
Used with confidence for over a third of a century
PURITAN MAID
Dealers in Most Principal Cities
Puritan Compressed Gas Corporation
BALTIMORE ATLANTA BOSTON CHICAGO CINCINNATI DALLAS
DETROIT NEW YORK ST. LOUIS ST. PAUL KANSAS CITY
"Puritan Maid" Anesthetic, Resuscitating and Therapeutic Gases and Gas Therapy Equipment, including Hospital Oxygen Piping System Equipment.
Since 1913
PLEASE NOTE: You can secure PURITAN products of highest quality, long-established reputation, and at the best of prices, without a signed contract.

The Journal of the American Association of Nurse Anesthetists is published quarterly by the American Association of Nurse Anesthetists, 22 E. Division St., Chicago 10, Ill. Entered as second class matter, May 14, 1945, at the post office at Chicago, Ill., under the act of March 3, 187[illegible] Address all communications relative to editorial and advertising matters to the Editor, 22 E. Division St., Chicago 10, Ill. Subscription prices: to members, 50c a year; to nonmembers and institutions $1.50 a year; single copies, 50c. The opinions expressed in the columns of the Journal are those of the contributors and are not to be construed as reflecting the views of the American Association of Nurse Anesthetists.

most widely used

"Ether continues to be the most widely used general anesthetic. It is the standard with which all newer anesthetics are compared . . ." [1]

Because of its wide margin of safety, relatively low toxicity, economy and ease of administration, ether remains the standard drug for inhalation anesthesia.

For almost 100 years surgeons all over the world have depended on Squibb Ether – confident of its purity, uniformity and efficacy.

SQUIBB ETHER

1. Goodman, L., and Gilman, A.: *The Pharmacological Basis of Therapeutics*, New York, The Macmillan Co., 1947, p. 58.

IN COLOR . . . WITH SOUND

Presenting for Professional Groups

THE MOTION PICTURE

"Anesthesia with Vinethene"

Available on loan to anesthesiologists and other professional groups, this highly interesting film portrays technics for the administration of Vinethene and precautions to be observed in the use of this quick-action inhalation anesthetic.

It includes methods of administration for short medical and dental operative procedures—also for use as an induction agent prior to the administration of ethyl ether, and as a complement to nitrous oxide-oxygen.

It is a 16 mm. Kodachrome, sound-track film of one reel with a running time of 25 minutes. A sound projector is required for its showing.

Mail requests to MERCK & CO., INC., Attention of Film Loan Service, Rahway, N. J.

MERCK & CO., INC
Manufacturing Chemists
RAHWAY, NEW JERSEY

Vinethene®

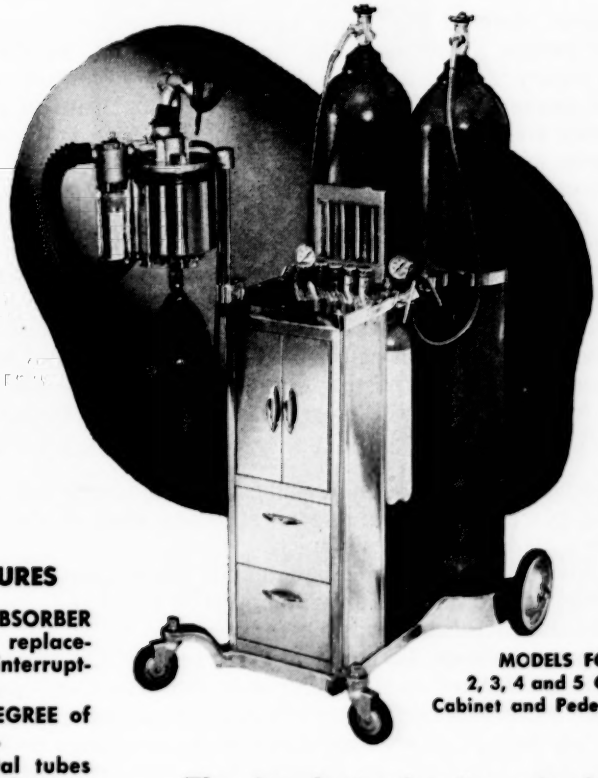
(VINYL ETHER FOR ANESTHESIA U. S. P. MERCK)

An Inhalation Anesthetic for Short Operative Procedures

COUNCIL ACCEPTED

The E & J Anesthesior

A New Instrument for All Usual and Special Forms of Anesthetic Gas Administration



MODELS FOR
2, 3, 4 and 5 GASES
Cabinet and Pedestal Types

NEW FEATURES

3-CANISTER ABSORBER for soda-lime replacement without interrupting anesthesia.

ADJUSTABLE DEGREE of CO_2 absorption.

NO PIPES, metal tubes or soldered joints to loosen or leak. *All gas passages drilled in cast Table.*

FLOW VALVES stainless steel with silver seat for exact regulation without creep. Replaceable as a *unit* merely by unscrewing from Table.

FLOWMETER PANEL sturdy one-piece construction, removed for cleaning or replacing flowmeters by loosening two bolts.

ABSORBER attaches to either side of stand, automatically locks at any height.

The Anesthesior has been developed by E & J scientists and engineers to provide a superior facility for gas anesthesia administration. Its operation is easier and more convenient, its control finer, its maintenance much simpler and its greater versatility a definite contribution to the further refinement of administration techniques.

Write to E & J today for complete Anesthesior data.

E & J MANUFACTURING CO.
Glendale 1, California

OPINION REVIEW

"NIGHT CALL" AND OBSTETRIC ANESTHESIA

The basic duty of the nurse anesthetist is no different from that of any other person involved in the care of the sick. If the nature of the illness or injury is such that life depends on surgical care being given at a particular moment, no matter what the hour, our duty to humanity leaves us no choice and no reason for argument. I believe my fellow anesthetists would agree with me.

However, there should be a redefinition of the word "emergency." When a surgeon asks the help of the operating team for a patient who could as easily have the operation a week later, we do not consider such a case an emergency, nor do we feel that we want to be routed from our beds to help. Surgeons work a hardship on the anesthetists when they operate at night for reasons all their own. Unless the staff is large enough so that the anesthetists on call at night are not scheduled to work another shift, those in charge of posting surgical schedules should discourage any tendency to abuse the word "emergency."—ALBERTA BOGGAN, R.N., Birmingham, Ala.

The responsibility for night anesthesia service must fall somewhere, and the logical place is on the nurse anesthetists, even if the organization is headed by a medical anesthesiologist.

We know full well that the demand for nurse anesthetists is far greater than the supply, and that this situation must be faced and managed somehow.

One of the factors responsible for the scarcity of nurse anesthetists is poor personnel policies. To me, "On Call" means "On Duty," which should be paid for and treated as such. Our only recourse, then, is to improve personnel policies by indorsing more effective recruitment programs to interest a greater percentage of registered nurses in anesthesia courses. Then, and only then, can "On Call" be changed to a straight eight-hour day and a forty-hour week, which should be our goal.

From the standpoint of the efficiency as well as the personal health of the worker, straight eight-hour duty is recognized as the most acceptable work period. These hours permit the anesthetist to live normally and round out her day with recreation. I speak from experience, as we at Mt. Carmel Mercy Hospital have enjoyed straight eight-hour shifts for the past two years, and believe me when I say: There *is* no comparison. My sympathy goes out to those anesthetists who still work a split shift.

Having gone this far, I hope this discussion is followed by an *Opinion Review* on proper remuneration for services rendered.—SINA B. WILLIAMS, R.N., Detroit.

In many hospitals anesthesia in the delivery room is considered a minor procedure; therefore, untrained personnel often administer the anesthesia.

There are several reasons for having a well trained anesthetist for obstetric cases: (1) Two lives are involved. (2) The metabolic factor must be considered, as pain, emotional excitement, and premedication influence it

1881 - 1935

For 40 Years . . .

A Spirit that Soars

"He developed his first gas apparatus for anesthesia in 1910. In so doing he became an integral part of the gas era, which has since meant so much for . . . humanity."*

It was while Dr. Elmer Isaac McKesson was an interne that he did this.

Here was the start of an industry destined to mirror the spirit of this man . . . a man whose scientific and inventive genius was to impart inspiration . . . to those who helped him during his lifetime . . . and carried on thereafter.

And now, four decades later . . . when the company he founded celebrates its 40th anniversary . . . that same spirit soars ceaselessly in the hearts of those who have the proud privilege of carrying on that great tradition.

**Excerpt from Memorial Address at 1936 Clinical Congress of Surgeons.*

McKesson APPLIANCE COMPANY
TOLEDO 10, OHIO

McKESSON'S 1910 40th 1950 ANNIVERSARY

directly. (3) Many obstetric patients have not had prenatal care or a physical examination and may have a cardiovascular condition not known to the attending physician or anesthetist. (4) Upper respiratory diseases are not infrequent. (5) Patients are unprepared for anesthesia. The obstetric patient usually enters the hospital after labor has begun and in many instances after the ingestion of food.

Many obstetricians believe peristaltic action ceases and food remains in the stomach when labor pains ensue. Often during the induction of anesthesia the patient may become nauseated, and vomiting may be one of the complications. The anesthetist must be capable of handling situations of this kind. Suctioning may be required to prevent cyanosis and aspiration. An adequate airway must be maintained and if necessary an intratracheal tube inserted for resuscitative measures.

We must bear in mind the necessity for the anesthetist to be familiar with resuscitative measures for the newborn.

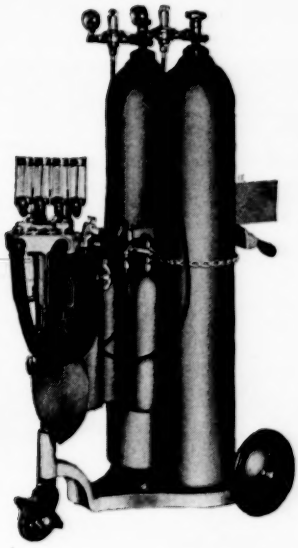
For the administration of any anesthetic agent, a well trained person should be available in the delivery room as well as in the operating room. —Rosella Crotty, R.N., Eau Claire, Wis.

Every anesthetist should be intensely aware of the inherent challenge in the art of obstetric analgesia and anesthesia. The tendency to minimize the importance of obstetric anesthetic procedures and the difficulties that may be encountered is both deplorable and dangerous. Nowhere else are more variable factors encountered and more instantaneous and exacting judgments required. Not only must the anesthesia be sufficient for whatever operative procedure is to be undertaken, but the welfare of the infant must also constantly temper the choice of agent, depth of anesthesia, etc. Some of the variable factors are time and amount of premedication prior to delivery, prematurity, strength of efficacious contractions, and the frequent presence of a stomach full of undigested food. Add to this the ever present danger of a sudden profuse hemorrhage, and the problem that presents itself is never one to be undertaken lightly. The old adage that there are many "minor operations" but never a "minor anesthesia" is most applicable in the field of obstetrics.

It is not my intention in this brief paper to discuss the special technics involved or the choice of agents employed in obstetric anesthesia, but rather to point out the prerequisites for satisfactory hospital service in relation to the obstetric department. The basis for any good obstetric practice is, of necessity, a complete integration of the skills of the obstetrician and the anesthetist. New concepts of psychosomatic medicine have highlighted the importance of insuring the patient's confidence both in her physician and in the hospital facilities for the relief of pain. Since the perfect analgesic and anesthetic drug insuring absolute relief of pain combined with perfect safety has never been found, we must rely chiefly on other methods. In most general hospitals today this means the use of some inhalation anesthetic agent. We feel that a satisfactory service must meet the following requirements: (1) the constant availability of a well trained anesthetist for the obstetric service; (2) proper equipment for analgesia, anesthesia, and infant resuscitation; (3) ability to provide analgesia in selected cases for reasonable periods of time; (4) flexibility.

For the perfect conduct of comfortable or painless labor analgesia is essential during the first stage, but anesthesia by inhalation is required for

(Continued on page 294)



McKESSON'S 40th ANNIVERSARY 1910 1950

MODEL **N** 664-A

'N' is for New . . . and Numerous

Last year, McKesson's Model **N** Anesthesia Machine stood for **New** . . . **New** Flowmeter Features . . . **New** Flush Valve features . . . **New** Design . . . and a host of other features.

This year 'N' is for **Numerous** . . . **Numerous** because you anesthetists have demanded so many of them . . . **Numerous** because of the many compliments you have paid them . . . **Numerous** because of their superb and reliable performance.

If you don't happen to know all about McKesson's Model N Anesthesia Machine . . . write today by card or letter for our free catalog.

Thoughts While Holding Up a Chin—The amount of oxygen that is available is that which is actually inspired—not what the machine is delivering.

McKesson APPLIANCE COMPANY
TOLEDO 10, OHIO

BARALYME *at a New Low Price!*

MANY HOSPITALS gladly paid a per-pound premium price for safe, non-caustic BARALYME, knowing the material actually cost less per hour of anesthesia because of its high efficiency over a longer life.

This demand grew. Increased production now enables us to pass a price reduction on to you. The new price on BARALYME is per-pound comparable to the price of soda lime.

INDICATOR NOW OPTIONAL!

By popular demand we now have available **BARALYME** with color dye that indicates exhaustion

BARALYME is a mixture of barium hydroxide and calcium hydroxide, entirely stable well above ordinary room temperatures. It has a practically unlimited shelf life, requires no rest periods, generates less heat, dusting is minimized, has no unpleasant odor, no false temporary peak of CO_2 concentration.

Write today for a free sample for your own tests.

THOMAS A. EDISON, INCORPORATED
Medical Gas Division
STUYVESANT FALLS, NEW YORK

MEDICAL GASES *and* EQUIPMENT • THE EDISON ETHERIZER

The Journal of the American Association of Nurse Anesthetists

VOLUME XVIII NOVEMBER, 1950 NUMBER FOUR

BYLAWS ARE NECESSARY

Some persons have the mistaken idea that bylaws and rules are superfluous, tiresome, tedious, uninteresting, and something to ignore. Let us consider this matter. Could we function as an orderly association without specific rules and regulations to serve as a guide in conducting our affairs? Bylaws are nothing more than laws of procedure, the sole purpose of which is to set up rules and regulations that provide reasonable and intelligent management. Our government must have laws in order to function, and likewise any organization, regardless of size, must have laws for its own government. It is axiomatic in legal circles that no law is a good law that is not a fair law. Laws are designed to carry out the will or wishes of the majority.

Bylaws should be considered the responsibility of every individual member and not merely that of the officers and members of the Revisions Committee. We have national bylaws, assembly rules or bylaws, and state bylaws. Every member should be familiar with the provisions of these respective laws. You should carefully read and study these laws in order to acquaint yourself with their contents. If you find any of them confusing, unfair, or inadequate, speak up. Consider it your prerogative to consult the Revisions Committee.

In 1948 the national bylaws were completely revised and approved. Further amendments were approved and added in 1949. States have since been asked to revise their bylaws to conform with those of the national association. This is mandatory. A set of model bylaws was prepared by the national Revisions Committee to serve as a pattern to assist the state associations in revising their bylaws. Additions and changes may be made to meet the special requirements of the individual states. A substantial majority of the states have had their bylaws revised and approved. There are still a few who have not done so. It is the hope of the national Revisions Committee that the entire project may be completed in the near future.

We live, learn, and grow, and situations may arise that may necessitate future changes or additions to our bylaws. That is why a provision is made for amending them.

If you know and understand the *Bylaws,* you will be better able to participate in meetings and will have a better knowledge of parliamentary procedure.—HAZEL J. PETERSON, R.N.

ANESTHESIA FOR SURGICAL PROCEDURES FOR INTESTINAL OBSTRUCTION

John A. Paulson, M.D.*
Rochester, Minn.

The choice of anesthesia for surgery of any type involves a careful weighing of all factors associated with the pathologic processes existing within the patient for whom operation is contemplated.

As an aid to an understanding of the pathologic processes involved in intestinal obstruction and how they may complicate the problem of anesthesia, it seems worth while to discuss briefly the normal physiology of the intestine.

Physiology of Intestine

The intestine may be arbitrarily considered as having three divisions[1]: The so-called foregut consists of the stomach and duodenum and is concerned primarily with the digestive processes. The midgut consists of the jejunum, ileum, and right half of the colon and is chiefly concerned with absorption. The midgut also may be considered as having three divisions with respect to function: (1) The jejunum secretes succus entericus and mixes it with the digesting food coming from the stomach and duodenum. (2) The ileum absorbs food materials from the mass coming from the jejunum. (3) The right half of the colon is chiefly concerned with the absorption of salts and water from the residue coming from the ileum. The third and last of the three main divisions of the intestine is referred to as the hindgut. This portion consists of the left half of the colon and includes the sigmoid and rectum. It is chiefly concerned with the storage and finally with the expulsion of the unabsorbed residue of food materials.

Under ordinary conditions the upper part of the gastrointestinal tract secretes approximately 7,000 cc. fluid each day as follows[2]:

Saliva—1,000 to 1,500 cc.
Gastric juice—2,000 to 3,000 cc.
Bile—300 to 500 cc.
Pancreatic juice—500 to 800 cc.
Succus entericus—1,000 to 3,000 cc.

Since these juices are, for the most part, excreted from high in the gastrointestinal tract and reabsorbed from the lower part of the gastrointestinal tract, it is obvious that obstruction occurring at any point between the areas of secretion and those of reabsorption must seriously interfere with fluid and electrolyte balance. Other alterations of normal physiology resulting from or accompanying obstruc-

---

Read before the Minnesota Association of Nurse Anesthetists with the Upper Midwest Hospital Conference, Minneapolis, May 19, 1950.
*Section on Anesthesiology, Mayo Clinic.

1. Lichtenstein, M. E.: Basis for planned management in intestinal obstruction. Am. J. Surg. 78:362-370, Sept. 1949.

2. Kremen, A. J.: Surgical physiology of bowel obstruction. S. Clin. North America 29: 1775-1788, Dec. 1949.

tion to the normal passage of materials through the intestinal tract are related chiefly to the effects of distention on the normal function and viability of the intestine, the toxic factors associated with intestinal obstruction, the relationship of bacterial growth to intestinal viability, and problems attending the blood supply of the intestine itself.[2]

When the obstruction is high in the intestine, early and copious vomiting is a consistent symptom. Loss of gastric juice results in a decrease in blood chlorides followed by alkalosis. This imbalance of electrolytes is always followed by a marked loss of fluid, which results in serious dehydration. In this type of case as much as 10,000 to 11,000 cc. fluid and 40 to 50 Gm. sodium chloride may be required in twenty-four hours to maintain the fluid and electrolyte balance.

When obstruction is low in the intestine, vomiting is seen as a late symptom, and dehydration is not due so much to vomiting as to loss of large amounts of fluid into the distended loops of intestine. As a result, administration of water and electrolytes does not cause the dramatic improvement in the patient's condition that is seen when the obstruction is high. In other words, the dominant pathologic picture in low obstruction is distention rather than dehydration.

Prolonged distention may be very serious and cause mucosal degeneration as evidenced by petechial hemorrhages, erosion, and ulceration. Pressure results in a slowing of the flow of blood through the vessels in the bowel wall, which in turn endangers the viability of the bowel and causes great discomfort to the patient. At the same time this distention may exert pressure upward onto the diaphragm and result in both respiratory and cardiac dysfunction. According to Bellis and Wangensteen,[3] there is interference with venous return from the lower extremities during distention. Conceivably, this factor could predispose to thrombophlebitis and possibly to the hypotensive state often seen with intestinal obstruction. During prolonged distention there may be marked engorgement of the blood vessels of the wall of the bowel, resulting in a serious loss of blood proteins from the mucosal surface as well as into the peritoneal effusion fluid.

These factors not only have a deleterious influence on the bowel itself but are reflected in the patient's general condition by contributing to a chain of events predisposing the patient to circulatory failure and shock. In strangulation obstruction the loss of blood into the wall of the bowel, the lumen of the intestine, and the peritoneal cavity may be sufficient to cause shock.[4] This effect is usually seen in venous rather than arterial obstruction. The characteristic physiochemical changes occurring in intestinal obstruction are[5]: (1) hemoconcentration with shrinking of the plasma volume, (2) reduction of fixed base in the serum, (3) diminution of plasma chlorides, (4) increase in blood urea and nonprotein nitrogen, (5) increase in carbon dioxide—combining power of plasma, and (6) highly acid urine that may contain ketone bodies and show a reduction of chlorides.

2. Ibid.

3. Bellis, C. J., and Wangensteen, O. H.: Venous circulatory changes in the abdomen and lower extremities attending intestinal distention. Proc. Soc. Exper. Biol. & Med. **41**:490-498, June 1939.

4. Scott, H. G.: Intestinal obstruction; experimental evidence on the loss of blood in intestinal strangulation. Arch. Surg. **36**:816-837, May 1938.

5. Schloss, E. M.: Physiochemical changes in intestinal obstruction. M. Clin. North America **32**:1717-1723, Nov. 1948.

Although the exact cause of obstruction is not always important in making a choice of anesthesia, it may indicate the probable extent of the contemplated surgical procedure and the supportive measures that may be necessary during the operation.

The patient to undergo operation for intestinal obstruction may be extremely ill, or, on the other hand, he may be in suitable condition to tolerate the anesthesia and operation well. The condition of the patient, of course, depends on many factors: age, the place and cause of obstruction, the duration of obstruction, and the preoperative preparation, such as decompression, transfusions of blood or plasma, and replacement of fluids and electrolytes. In most instances preliminary preparation of the patient is the concern of the attending surgeon or the internist or both and will have been carefully planned and executed by the time the patient comes to surgery, so that optimal operating conditions will probably have been achieved.

When anesthesia is to be chosen for a patient suffering from intestinal obstruction, the first consideration should be the general condition of the patient, both prior to his present illness and at the time of operation. A survey should be made of previous illnesses, acute and chronic, and special attention should be paid to the condition of the cardiovascular, respiratory, and genitourinary systems. Pertinent data derived from the record should be considered in the light of his present condition. In evaluating the condition of the patient at the time of operation, one should consider such factors as his age, general appearance, and state of hydration; quality, rate, and rhythm of his pulse; blood pressure; presence or absence of distention; and whether he is or has been vomiting recently. It is also important to review the results of laboratory tests, such as erythrocyte count, hematocrit readings, leukocyte count, concentration of hemoglobin, plasma proteins, plasma chlorides, blood urea, nonprotein nitrogen, and carbon dioxide —combining power. Obviously, in many instances all of these determinations will not have been made, but all available information should be utilized in order that the anesthetist may have the best possible picture of the patient's general condition before anesthesia is chosen.

Saklad[6] suggested four headings under which to group the various criteria used in choosing anesthesia for any condition. They are: (1) the effect of anesthesia on existing pathologic processes in the patient, (2) procedures designed to aid the surgeon, (3) site of operation, and (4) the ability and judgment of the anesthetist. These criteria will be further discussed later.

In choosing anesthesia for any condition one must always be mindful of the indications and contraindications resulting from conditions other than the one for which the operation is being performed. In this article, in which the various agents and methods of anesthesia that may be used for operations for intestinal obstruction are discussed, it is assumed that the patient has or has had no significant pathologic processes except those directly associated with the intestinal obstruction. In actual practice, however, any choice of anesthesia would have to be considered in the light of any and all conditions that might influence that choice and not just those related to the intestinal obstruction.

6. Saklad, Meyer: Criteria in the choice of anesthesia. Anesthesiology 2:172-178, Mar. 1941.

Effect of Anesthesia on the Existing Pathologic Process in Intestinal Obstruction

In intestinal obstruction the pathologic change with which we are chiefly concerned is primarily related to the general effects of the obstruction rather than to the cause of the obstruction itself. It is these effects of obstruction that exert the greatest influence on the choice of anesthesia. The most important effects of obstruction are dehydration, starvation, infection in the wall of the bowel, and anoxia. As has been stated, dehydration and starvation, as a rule, will have been treated and brought under control as well as possible by the attending surgeon or the internist or both and consequently do not greatly influence the choice of anesthesia except, of course, the evaluation of the patient's general condition. The presence or absence of infection in the intestinal wall probably is not an important factor in the choice of anesthesia. An intestine thus affected may be more susceptible to rupture, and it behooves the anesthetist to be certain that adequate relaxation is provided in order that excessive trauma to the bowel may be avoided. In intestinal obstruction the problem of anoxia is probably more important than it is in many other conditions, as the respiratory and sometimes the cardiac function of the patient have already been interfered with as a result of the distention. Pressure on the diaphragm exerted by the dilated loops of bowel causes a reduction in the intrathoracic negative pressure and tends to lower the tidal air. The reduction in intrathoracic pressure not only interferes with oxygenation but also may interfere with cardiac function by causing the venous return to the heart to be decreased. This, in turn, causes a reduction in the cardiac output and results in a lowering of the arterial blood pressure.

Site of Operation

In choosing anesthesia for operations to relieve intestinal obstruction, it is obvious that only those agents that fill the requirements of anesthesia for abdominal surgery should be considered. These agents and methods, of course, must provide analgesia and safety for the patient as well as muscular relaxation to aid the surgeon.

Measures to Aid the Surgeon

This consideration is probably more important in operations for intestinal obstruction than in most other types of surgery because the patient is often quite ill, and gentle handling of tissues as well as speed in completing the surgical procedure is important to the final outcome. This can only be accomplished by providing adequate analgesia plus the adequate relaxation that is so necessary in surgery for intestinal obstruction. Occasionally, it is necessary to change the patient from the supine position. This usually means changing from the horizontal supine position to varying degrees of the Trendelenburg position. The effect of the Trendelenburg position on the vital functions of the heart and respiratory system may be marked, and anesthetists must be prepared to recognize these changes and institute supportive measures when they are indicated.

Ability and Judgment of the Anesthetist

It is often said that in a certain condition a certain agent or method

of anesthesia is ideal and should be the method of choice. This statement is partially true, but when such a statement is made, it must be presupposed that the anesthetist is thoroughly familiar with the method named, is aware of all the possible effects and complications resulting from its use, and furthermore is prepared to cope with these complications if and when they do arise. Curare, for example, should certainly never be used by an anesthetist who is not familiar with its chief pharmacologic properties, especially its ability to paralyze respiration. Even if these properties are thoroughly understood, this drug should never be used unless the anesthetist is capable of performing adequate and efficient artificial respiration. In addition to being familiar with the properties and the use of the agent in question, it is highly desirable that the anesthetist have a good understanding of the pathologic processes being dealt with at the time of operation. The ability and judgment of the anesthetist are very important considerations in the selection of anesthesia in all instances.

Specific Agents and Methods

Spinal anesthesia.—Spinal anesthesia for operations to relieve intestinal obstruction is considered by many to be the method of choice, provided there are no contraindications to its use. There are, however, frequently many contraindications to its use in intestinal obstruction, and consequently spinal anesthesia is not used so often as might be desired. By virtue of the paralyzing effect of spinal anesthesia on the sympathetic fibers, the intestine is caused to contract and consequently is easier for the surgeon to handle. No other method of anesthesia will produce this state of contraction to the same degree that spinal anesthesia does. In general the relaxation of the abdominal wall afforded the surgeon by spinal anesthesia is ideal and probably can not be equaled by any other means. In addition to these factors it is often desirable to have the patient awake so that his pharyngeal and laryngeal reflexes are active in case he should regurgitate during the operation.

Unfortunately, spinal anesthesia cannot always be used for patients who have intestinal obstruction because of their poor general condition. A contraindication to spinal anesthesia may be considered to exist when a state of marked debility is present. Factors producing this debility may include anemia, hypotensive or shock states, marked dehydration, and acute toxemia. Any one of these conditions should be considered a relative contraindication to spinal anesthesia. Unfortunately, one or several are often present during acute intestinal obstruction. Some authorities consider spinal anesthesia to be contraindicated in all cases of intestinal obstruction because of the alleged danger of rupture of a devitalized portion of the bowel when the bowel is caused to contract by the spinal anesthesia. I have never seen this happen.

Ether anesthesia.—It is generally accepted that ether is a relatively safe anesthetic agent for use in a wide variety of conditions. If ether anesthesia is well conducted, it is acceptable in many cases of intestinal obstruction. Induction and recovery are slow, and if the patient has been vomiting, the chances of his vomiting during induction and recovery are fairly great, with the possibility of aspiration of vomitus. To obtain relaxation adequate for the operation contemplated, anesthesia with ether may have to be

carried to a fairly deep plane. As a result the operation may be unnecessarily shocking. The incidence of nausea and vomiting following ether anesthesia is notably high and may make maintenance of a proper fluid and electrolyte balance somewhat more difficult than usual. Nausea and vomiting also add to the patient's general discomfort. Whether or not ether is really responsible for the apparent increase in distention after anesthesia with this agent has not been proved conclusively, but in view of the fact that it has been condemned for this effect, the choice of ether for anesthesia in intestinal obstruction may be somewhat influenced by this contention.

Cyclopropane. — This agent has certain advantages when used for operations for intestinal obstruction. It is not an unpleasant gas to take, and induction and recovery are rapid. Because of the shorter induction and recovery time, aspiration of vomitus is less likely to occur. As with ether, adequate oxygenation with cyclopropane is easily provided. It is difficult to produce adequate relaxation with cyclopropane alone unless anesthesia is carried to a dangerously deep plane. The addition of ether to the cyclopropane modifies this objection. Because cyclopropane and ether are both explosive agents, the use of cautery and diathermy during operation is contraindicated. Cyclopropane is probably used to best advantage when curare is administered as a supplementary relaxant. With this combination it is possible to obtain relaxation nearly equal to that obtained with spinal anesthesia, while at the same time anesthesia can be maintained in a light plane. With this combination respiration need not be greatly affected and can be easily aided if necessary. Blood pressure and circulation are usually well maintained. Neither curare nor cyclopropane has any significant effect on the intestine. The marked contraction of the intestine seen when spinal anesthesia is used is not seen when cyclopropane and curare are used. It is my contention that, if the use of spinal anesthesia is precluded, cyclopropane with curare is the anesthetic agent of choice for operation for intestinal obstruction.

Pentothal sodium. — Used alone, pentothal sodium has no place in anesthesia for operation for intestinal obstruction. It is useful, however, when it is combined with other agents. As is well known, pentothal sodium has poor analgesic properties, and if massive doses of this drug are to be avoided, it should be combined with an agent possessing the ability to produce analgesia. With premedication with morphine or a similar drug, nitrous oxide with pentothal sodium affords good analgesia. By itself nitrous oxide is a weak anesthetic agent and is incapable of producing surgical anesthesia for more than a very short time without producing hypoxia. When pentothal sodium and nitrous oxide are used together, the hypnotic effects of pentothal sodium plus the analgesic properties of nitrous oxide permit their use for many types of operations that would be highly impracticable, if not impossible, to accomplish with either agent alone. This combination is still incapable of producing the relaxation necessary for most types of abdominal surgery. By the addition of curare adequate relaxation for abdominal surgery is easily obtained. This use of pentothal sodium, nitrous oxide, and curare represents an excellent example of "balanced anesthesia," as described by Lundy.[7]

7. Lundy, J. S.: *Clinical Anesthesia* (Philadelphia: W. B. Saunders Co., 1942) p. 559.

When this type of anesthesia is used, I prefer to think of the pentothal sodium as providing the basal anesthesia, which is deep enough to allow nitrous oxide to function efficiently and adequately and still permit adequate amounts of oxygen to be used. This means that relatively high concentrations of nitrous oxide must be used, that is, maximal flow meter settings of 60 to 70 per cent nitrous oxide and 40 to 30 per cent oxygen. With these settings the rebreathing bag occasionally should be emptied and refilled in order that adequate concentrations of oxygen may be assured the patient at all times.

When curare is used with this combination, it can be used most efficiently when injected separately and not mixed with the pentothal sodium. To me it is inconceivable that all patients under any and all operative conditions require the same proportions of pentothal sodium and curare, as must be assumed to be true when a mixture is used. The combination of pentothal sodium, nitrous oxide, and curare can be used with relative safety in surgery for intestinal obstruction. Recovery is usually prompt but may be delayed. If vomiting or regurgitation should occur during light anesthesia, the danger of laryngospasm represents one of the real disadvantages of this method.

Intratracheal intubation.—In any form of general anesthesia for intestinal obstruction it is always desirable to have an intratracheal tube in place. This affords an excellent airway at all times and helps to maintain smooth anesthesia. A tube in place also helps to prevent aspiration of vomitus. However, if aspiration should occur, the presence of an intratracheal tube facilitates suctioning of the aspirated material.

Other methods. — Various combinations of local and regional anesthesia have been suggested, but, for the most part, they are not satisfactory alone and must often be supplemented with another type of anesthesia. When it is highly desirable to use the smallest possible amount of general anesthesia, it may be advantageous to provide abdominal analgesia and relaxation by local or regional procedures, such as abdominal wall block or intercostal or paravertebral blocks. After this is done, light general anesthesia of one form or another is often sufficient for the surgical procedure. This method probably has no great advantage except when the patient is very ill.

In regard to premedication for patients about to undergo operation for intestinal obstruction, there are no specific rules to follow as dictated by the condition. Premedication should be administered as usual with careful consideration being given to the age and general condition of the patient as well as to the type of anesthesia to be administered.

American Association of Nurse Anesthetists

Officers and Trustees

1950-51

President:
Verna E. Bean, Kentucky
1st Vice President:
Josephine Bunch, Oregon
2nd Vice President:
Minnie V. Haas, Texas
Treasurer:
Agnes Lange, Illinois
Trustees:
Harriet Aberg, Illinois
Lillian Baird, Michigan
Mary A. Costello, Ohio
Betty E. Lank, Massachusetts
Edna Peterson, California
Hazel Peterson, Minnesota

FLUID ADMINISTRATION FOR THE SURGICAL PATIENT

A. R. Curreri, M.D.*
Madison, Wis.

The high level of success enjoyed by surgery today may be accredited in a large measure to the judicious use of parenteral fluids. Just as the discovery of antisepsis and anesthesia permitted the development of operative procedures based on physiologic and pathologic principles, so has the introduction of parenteral fluids and antibiotics not only broadened the surgical horizon but also reduced mortality and morbidity to a level never dreamed of by surgeons of fifty years ago.

Often the need for fluids may be acute and alarming, and their intelligent use may spell the difference between successful recovery and death. Unfortunately, the improper administration of fluids, either qualitatively or quantitatively, may be extremely detrimental to the patient. Therefore, it is important that some simple but rational rules for the use of parenteral fluids be established that will be applicable in most surgical cases.

Undoubtedly, unusual situations will arise in which special studies and the administration of special solutions will be required because of a complex alteration in body chemistry. It is not within the scope of this brief presentation to cover such situations, nor should it be the nurse's responsibility or prerogative to cope with them. Furthermore, the inclusion of such unusual cases may confuse the picture.

The importance of water for the preservation of life has been well demonstrated in animals. An animal will survive even though practically all of its carbohydrates and 50 per cent of its proteins are dissipated. On the other hand, a 10 per cent water loss markedly impairs body function, and a 20 per cent loss usually results in death.

Approximately 70 per cent of the body weight is formed by water. Physiologically, this water is found either in the cells of the body or in the circulation. This division may be described as intracellular fluid and extracellular fluid. The intracellular fluid constitutes approximately 50 per cent of the body weight and the extracellular 20 per cent. A definite balance of cellular and circulating fluid is continually maintained by their relative osmotic pressures. In the cells the osmotic pressure is maintained by the concentration of potassium, and in the circulating fluid by the concentration of sodium. Thus the concentration of these two bases in their respective compartments determines the distribution of the body water.

The need for water by healthy individuals varies considerably, depending on its availability, the

Read before the Tri-State Assembly of Nurse Anesthetists, Chicago, May 1, 1950.
*Associate Professor of Surgery, University of Wisconsin Medical School.

atmospheric pressure, and exercise. However, normal body function demands a constant level of water both in the cells and in the circulating blood. Therefore, in order to maintain this constant level when circumstances requiring more water arise, either the fluid intake must be increased by the individual, or the fluid excretion must be decreased by the body.

The body obtains water in three ways: (1) from actual fluid intake, (2) from the water content of food, and (3) from water derived from the chemical breakdown of proteins, carbohydrates, and fats to simpler molecules.

Water is also excreted in three ways. The least important is that lost through the stool, this loss rarely exceeding 100 cc. daily. The second method of water loss is through the kidney, where water carries out waste products in solution as urine. The third route is by water vaporization through the skin and lungs (perspiration and respiration).

The loss of water through vaporization from the skin and lungs acts as a heat-dissipating mechanism, and under conditions of high temperatures or unusual exercise several liters may be lost daily in this manner. This vaporizing mechanism has preferential rights for water, so to speak, over the kidneys. This fact is regularly observed in hot weather when, despite adequate water intake, there may be little urinary output because of excessive perspiration. On the other hand, the kidneys are important in maintaining water balance. This is best illustrated when a large amount of water is available and a large volume of urinary output results. Since waste products are diluted in this large volume of water, the specific gravity of the urine is low. If water is scarce, the urine volume is small and the specific gravity high because the amount of waste products remains the same. Therefore, in a normal person a small volume of urine with a high specific gravity indicates insufficient water intake.

A person who is capable of taking fluids orally rarely presents a problem with respect to water balance, since the water content of foods and water taken to quench thirst supply the normal body requirements. However, under certain abnormal conditions and after operations it becomes necessary to provide fluids parenterally.

Table 1.—Daily Water Requirements of the Surgical Patient

Uncomplicated cases	
Water for vaporization (skin and lungs)	1,500 cc.
Water for urine	1,000 cc.
Water for stool	50 cc.
Total	2,550 cc.
Complicated cases—fever, hyperthyroidism, shock, vomiting, diarrhea	
Water for vaporization or other loss	2,000-4,000 cc.
Water for urine	1,000-1,000 cc.
Total	3,000-5,000 cc.

Investigators have demonstrated that under average environmental conditions the body dissipates between 1,000 and 1,500 cc. water daily through the heat-regulating system (skin and lungs). Under extreme conditions, such as in fever and hyperthyroidism, an additional loss of 2,000 cc. may be encountered.

The amount of urinary excretion is determined by the volume required to keep waste products in solution. Normally, approximately 35 Gm. of waste products is excreted daily. The volume of water required to maintain this

TABLE 2.—FLUID, ELECTROLYTE, AND CALORIC REQUIREMENTS

TYPE OF FLUID	VOLUME IN CC.	NaCl IN GM.	GLUCOSE IN GM.	CALORIES
5% glucose in normal saline	1,000	9	50	200
5% glucose in distilled water	1,500	0	75	300
TOTAL	2,500	9	125	500
Additional 1,000 cc. 5% glucose in water will provide	3,500	9	175	700

quantity of waste product at a specific gravity of 1.015 is between 850 and 1,000 cc. Thus ideally the daily output of urine should be at least 850 cc., and the daily need in an uncomplicated situation should be between 2,000 and 2,500 cc. fluid. This amount should provide 1,000 cc. for urinary output and 1,500 cc. for loss by vaporization.

This knowledge has practical application preoperatively and postoperatively. For example, if any patient has a urinary output below 700 cc. with a high specific gravity, he is obviously in need of more fluid. Also, if 2,500 cc. fluid administered postoperatively results in a low urinary output, this low excretion may be attributed to either abnormal loss or abnormal retention. Abnormal losses may be due to increased activity of the heat-dissipating mechanism, large losses from the gastrointestinal tract, multiple fistulas, or hemorrhage. Abnormal retention of fluid may be due to excessive saline, reduced body proteins, or cardiac and renal failure. In any event, in the presence of an increased loss the deficit must be met, and at times an additional 2,000 to 3,000 cc. will be required.

After the total volume of water has been determined, one must then consider what kind of fluid should be given. In uncomplicated cases, when parenteral fluid administration is required for only a day or two, the addition of electrolytes and carbohydrates should be sufficient.

The average daily loss of salt from the body is between 3 and 5 Gm. Obviously, 1 L. normal or isotonic saline solution yielding 9 Gm. salt is more than ample to meet the daily requirements. Actually, as little as 500 cc. will meet the daily needs.

The question may be asked if any harm can result from the administration of large amounts of saline. If 2.5 L. normal saline solution were administered, the patient would receive 22 Gm. salt. Since only 3 to 5 Gm. is necessary, approximately 18 Gm. will be excreted from the kidneys. The normal kidney has no trouble performing this task, but a diseased kidney may have difficulty. Edema attends the retention of sodium, and with edema healing is poor. Even when kidney function is normal, the excretion of 18 Gm. salt requires sufficient water to keep it in solution. Thus in administering 2.5 L. normal saline solution one defeats one's purpose, for both water and salt are lost to the body. In the presence of a poor cardiac reserve or low body proteins, sodium is also retained by the body and gives rise to the tissue changes described previous-

ly. Coller and his associates showed that during an operation sodium is retained even though fluids are lost from the body. For this reason they advised against giving saline solution during the operative procedure. It must be apparent from our discussion that unless unusual conditions are present the administration of saline solution should be limited to 500 to 1,000 cc. daily.

If ½ to 1 L. saline solution meets the daily requirement in the uncomplicated case, what should constitute the remainder of the fluids for parenteral administration? Since the production of energy is most essential, the body will produce it at the expense of other functions to the detriment of tissues. Ordinarily, energy is derived from the oxidation of carbohydrates and fats. When these agents are lacking, the body turns to the protein in the organs and muscles and converts it into glucose and urea. This is best illustrated in starvation when, after the dissipation of fat and carbohydrates, wasting of tissues and muscles becomes apparent because body proteins are being utilized for energy. Therefore glucose should be administered to supply the ingredients needed for energy production and to spare proteins that are needed for function and tissue repair.

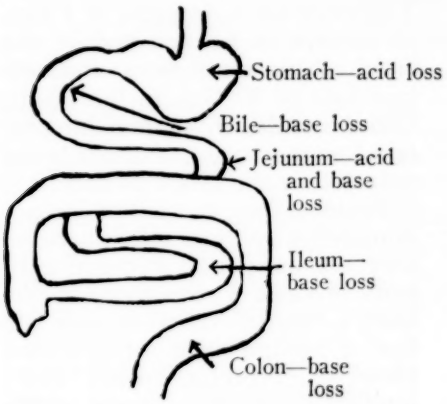
Inasmuch as each gram of glucose yields 4 calories, 1 L. of 5 per cent glucose solution will provide 200 calories. On the basis of our previous computation of daily water needs, 1 L. is ample for salt requirements, leaving 1,500 cc. for other uses. If this 1,500 cc. were administered as 5 per cent glucose solution, the patient would receive 300 calories. Under basal conditions approximately 800 calories is required, and for this reason 1,500 cc. of 5 per cent glucose solution would be insufficient. The additional requirement may be met partially by converting the 1,000 cc. of normal saline solution into 1,000 cc. of 5 per cent glucose in normal saline solution, so that this liter will yield 50 Gm. glucose as well as 9 Gm. salt. If the patient is given 2,500 cc. fluid in this manner, he will be provided with 9 Gm. salt and 125 Gm. glucose, or 600 calories. Admittedly, this is somewhat less than the basal caloric requirement. Therefore in order to meet the caloric requirement either 3,500 cc. of 5 per cent glucose solution or 1,000 cc. of 10 per cent glucose solution must be given.

In summary, sufficient fluids, electrolytes, and a good percentage of the caloric requirement may be offered the average patient if 1,000 cc. of 5 per cent glucose in normal saline solution and from 1,500 to 2,500 cc. of 5 per cent glucose in distilled water are given parenterally.

Ten per cent glucose solution has not been so popular as 5 per cent solution because on rapid administration a considerable percentage is excreted through the kidneys and also because of occasional venous irritation and an increased incidence of thrombophlebitis. However, these objections will be obviated if the 10 per cent solution is given slowly. Studies with the use of 10 per cent invert sugar solution show that it may be given very rapidly with practically no loss through the kidneys. In addition invert sugar is apparently utilized at least as well as glucose. In the future we may find greater use for this agent.

In certain diseased or complicated conditions there may be an

TABLE 3.—CONCENTRATION OF SODIUM CHLORIDE IN VARIOUS FLUIDS



	AVERAGE NaCl CONCENTRATION GM./L.
Vomitus	3.3
Wangensteen suction	5.7
Hepatic bile	5.1
Intestinal fistula	5.2
Diarrhea	4.3
Physiologic saline (isotonic)	8.5
Ringer's solution	7.0

abnormal loss of body fluids. This is particularly true in intestinal obstruction, large draining sinuses, postoperative thyrotoxicosis, shock, and diarrhea. In these conditions the fluid, electrolytes, and proteins lost must be replaced. Ordinarily, when electrolytes are needed, administration of normal saline solution will effectively combat the deficiency. Since sodium chloride contains both base ion (sodium) and the acid ion (chloride), a deficiency of either one will be corrected, and the undesirable ion discarded by the body. In other words, isotonic saline solution will combat alkalosis —a condition in which there is a deficiency of acid ion—or acidosis if there is a deficiency of base ion. In certain conditions attended by prolonged fluid loss, excessive loss of potassium may be noted. In such unusual conditions special fluids should be given under the direction of the physician.

The amount of sodium chloride required by a patient with excessive losses is determined in two ways. The first is by volume-for-volume replacement, and the second is by the physiologic response of the patient to test doses of parenteral fluids. In volume-for-volume replacement one simply replaces the fluid lost through continuous suction or drainage from a wound. In addition to his normal daily requirements the patient is given fluids in amounts equal to those lost. In the presence of gastroduodenal suction one must be extremely careful to replace only the amount of fluid excreted by the body. One should not include what the patient drinks. Often a nurse's record shows anywhere from 2,000 to 4,000 cc. fluid lost through negative suction. Rarely does a patient lose more than 1,000 cc. through continuous suction. The remainder represents what the patient drank and came through the suction tubing. In determining the amount of fluid lost daily through continuous suction, the nurse should subtract the amount drunk from the amount contained in the suction bottle.

The average base and chloride concentration of the various sources of fluid lost in the gastrointestinal tract has been determined. In all instances the elec-

trolyte concentration is less than that of normal saline solution, and therefore replacement with normal saline solution will more than adequately compensate for the loss, as shown in table 3.

The physiologic response of patients to the administration of electrolytes is resorted to when the loss cannot be determined. The patient frequently has been vomiting for many days, and it is practically impossible to learn from his history the amount lost. He should be given 1,500 cc. normal saline solution, and his clinical response observed with respect to alertness, normal breathing, and pulse. If there is no improvement, another 500 cc. may be given. As a rule, however, no more than 2,000 cc. saline solution should be given in the first twenty-four hours unless special studies are undertaken.

In cases of long standing starvation, large open wounds, diarrhea, fistulas, or long standing infections, it becomes necessary to supply not only water, electrolytes, and carbohydrates but also proteins and vitamins. In these conditions the protein reserves are depleted. From the standpoint of surgery it is important to maintain a normal protein level for three reasons. First, the body is continually destroying and excreting tissue protein. Second, proteins for the regeneration of tissues are only derived from endogenous or exogenous sources. Third, hypoproteinemia causes wound edema, vitamin C deficiency, and fibroblastic inactivity and therefore a high incidence of wound breakdown, or dehiscence.

Excessive protein loss can occur without a reduction in the blood protein level, because the concentration of protein in the tissues is thirty times greater than the concentration in the blood. Therefore for a decrease of 1 Gm. of protein to be detected in the blood, there must be a concomitant loss of 30 Gm. in the tissue. Consequently, an appreciable protein loss may occur without being reflected in the blood picture.

Proteins per se cannot be administered parenterally because they are antigenic. Because antigens produce a sensitivity in the host, a marked reaction may follow a second dose of proteins. However, proteins broken down into amino acids or some of the smaller polypeptides are not antigenic and may be given parenterally without danger of an allergic reaction. Another important fact is that the human body does not use or require all of the known amino acids. Approximately one half of the known amino acids are used by the body, and some play a greater role in tissue formation than others. It is therefore important to know the quality and quantity of amino acids and from what protein they are derived.

Commercial firms have recently made available amino acids produced either from milk or from fibrin. No more than 25 per cent utilization can be demonstrated when amino acids derived from milk are given intravenously. Better utilization is presumably obtained from the administration of amino acids derived from fibrin. If amino acids are given in the morning, no more than 10 to 15 per cent is utilized. The remainder is broken down into carbohydrates and urea. The reason for this peculiar behavior is that by morning the body has burned all available carbohydrates or glycogen for energy. Therefore, if amino acids are given in the morning prior to

TABLE 4.—FLUID, ELECTROLYTE, CALORIC, AND PROTEIN NEEDS

SOLUTION	VOLUME IN CC.	NaCl IN GM.	GLUCOSE IN GM.	CALORIES	PROTEINS IN GM.
5% glucose in normal saline	1,000	9	50	200	0
5% glucose in distilled water	1,500	0	75	300	0
5% glucose in 5% amino acids	1,000	0	50	200	50
TOTAL	3,500	9	175	700	50

glucose administration, the body will convert the amino acids into carbohydrates and urea for energy production. For this reason it is imperative to provide glucose prior to the administration of amino acids. In our clinic a patient is given at least 1,000 to 1,500 cc. glucose before amino acids are given. When this is done, the utilization of amino acids is improved 10 to 15 to 25 per cent. We cannot explain why the other 75 per cent is not utilized. A 1,000 cc. solution contains 50 Gm. of amino acids, and since 25 per cent of this is utilized, it is assumed that the patient receives 12.5 Gm. This amount only partially satisfies the amino acid requirement, since from 35 to 50 Gm. is needed to maintain nitrogen balance. Admittedly, 12.5 Gm. of amino acids is better than none. Therefore, if the patient needs protein, it would appear advisable to give 3,500 cc. fluid daily, consisting of 1,000 cc. 5 per cent glucose in normal saline solution, 1,500 cc. glucose in distilled water, and 1,000 cc. 5 per cent amino acids in 5 per cent glucose solution. This volume will yield 9 Gm. sodium chloride, 262 Gm. glucose, or 850 calories, and 12.5 Gm. utilizable amino acids.

Blood plasma is unquestionably the best source of fluid for replacement, for it provides both electrolytes and proteins. In addition it has a distinct advantage over other fluids in that its albumin does not cross the semipermeable membrane, and therefore it is ideal for use in preventing or combating shock. Disadvantages are the high cost and the occasional occurrence of virus jaundice. The latter is at present apparently under control. The expense is considerable for each pint of blood is approximately one half plasma. Therefore, since plasma is 6 to 7 per cent protein, 1 L. would contain 70 Gm., and one transfusion would provide ¼ L., or 17 Gm. protein.

The administration of whole blood is ideal when blood lost is to be replaced. When the loss of large volumes of blood is anticipated during an operation, administration of blood should be started early, and the rate of administration determined by the blood loss. One should not wait for signs of shock as a warning to start a blood infusion, for often by that time the state of shock is irreversible, and no amount of blood will restore the patient's condition to normal.

Vitamins are our next consideration. Representatives of drug companies have eulogized vitamins to a point where one wonders how anyone can survive a surgical procedure without these magic agents. Actually, most individuals undergoing emergency or elective operations have a reserve

(Continued on page 290)

GERIATRIC ANESTHESIA

Shirley M. Gillette, R.N.
Rochester, N. Y.

Until recently geriatrics was neglected by both physicians and lay persons. There was the feeling that the aged were just unavoidable nuisances. The increase in the average life expectancy from 50 years in 1900 to 66 years at the present time has resulted in an increase in the amount of surgical treatment given persons of advanced age. With the use of new and improved surgical technics and new anesthetic agents and technics, the outlook for the aged patient needing a surgical operation has been considerably improved.[1]

In this article some of the important aspects of anesthesia for the aged and some of the findings in a series of cases of aged patients studied at the Strong Memorial Hospital during 1949 will be reviewed.

Evaluation of Patient's Condition

Although patients 70 years of age and over are prone to have medical complications (cardiovascular, pulmonary, or renal), these complications in many cases are not sufficient to contraindicate surgery. It is well known that some patients are in better physical and mental condition at 60 than others are at 40. It has been said that "A man is only as old as his tissues."[2] Therefore it might be preferable to measure old age and evaluate the degree of senescent change not by years but by competency, i.e., the amount of work a person is able to do.

Senescent changes in aged patients must be taken into consideration if an operation is contemplated. Basically, there are wasting of tissues and dehydration, which alter the function of the organs and the metabolism of the body as a whole.[3] Himwich and Etsten[4] stated that the metabolic depression consists of a decreased oxygen uptake by the cerebral tissues, the higher centers being affected before the lower centers. This condition of lowered metabolism with respect to subphysiologic oxygenation, or anoxia, is especially important to the anesthetist.

In old persons reduction of the circulating blood volume, diminution of oxygenation of the blood, and disturbances in metabolism as a result of anesthesia and surgery are not well tolerated. Many of these patients with varying degrees of debility have considerably lowered resistance to infection, are prone to severe surgical shock, and usually have decreased powers of repair, and cardiac and respiratory degeneration.

Read before the Middle Atlantic Assembly of Nurse Anesthetists, Buffalo, May 26, 1950.

1. Alcock, H. B.: Anesthesia in aged patients. Med. Press **208**:44-47, July 15, 1942.
2. Jobson, P. L.: Risks associated with anesthesia of the aged. M. J. Australia **1**:138-140, 1948.
3. Baird, J. W.: Geriatrics and anesthesia. Anesthesiology **4**:17-24, Mar. 1943.
4. Etsten, B., and Himwich, H. E.: Signs and stages during sodium pentothal anesthesia. Anesthesiology **7**:536-547, Sept. 1946.

Sound preoperative diagnosis and evaluation of the physical status of the patient are of primary importance. Roentgenographic and electrocardiographic studies are essential. Complete urinalysis to determine kidney function is important in assessing the operative risk as well as in choosing the anesthetic agent. Evaluation of liver function is also of special concern since atrophy is usually present and function impaired, not particularly as a result of disease but of low glucose and protein intake in later years. When nonvolatile agents are used, the ability of the liver to detoxicate them must be assessed, and drugs that favor liver necrosis should be avoided when possible.

By physical examination and laboratory tests the cardiac reserve and the degree of degenerative disease present should be determined. Levine[5] in 1946 reported that in a group of 494 patients undergoing major operations, 414 had organic heart disease. The total mortality rate of this group was 12.1 per cent. The unexpected mortality rate (all cases in which it seemed that, had no operation been performed, the patient would not have died) was 6.3 per cent. Of the 347 patients over 70 years of age who were anesthetized at Strong Memorial Hospital during 1949, 51 per cent, or 180 patients, had diagnoses of cardiac disease. The mortality rate in this group was 2.3 per cent. However, the functional capacity of the diseased organ rather than the disease itself is the major consideration.[6] Hypertension without serious cardiac complications does not add much to the hazard of an operation. The development of drugs for rapid digitalization has eliminated many of the problems of patients with cardiac disease. Quinidine has been used successfully in treating arrhythmias, chronic auricular fibrillation in the presence of coronary sclerosis, and hypertension.[7]

Generally speaking, there are two main types of cardiac disease seen in old patients. The first includes mechanical impairment of the cardiac muscle or conducting mechanism, murmurs, and irregularities. The second stems from increased venous pressures of cardiac origin.

The first type does not present too much of a problem to the anesthetist, but it is important to maintain the rate and quality of coronary blood flow with as little change as possible. The dangers here are coronary thrombosis and direct damage to the cardiac muscle. In a young heart a moderate degree of cyanosis may cause a fourfold increase in coronary blood flow, whereas in an aged heart this increase may not be possible, and a little oxygen lack may cause severe myocardial anoxia.

In the second group there are several dangers. The condition of the cardiac muscle is such that a venous pressure higher than normal is required to elongate its fibers for each beat. Also, the increased venous pressure causes exudation of fluid into the alveoli; the results are a reduction in oxygen absorption and dilatation of the vessels, which occludes some alveoli and thereby reduces vital capacity. Ascites may also accompany this type of cardiac disease, and the resulting increased intra-abdominal pressure further reduces vital capacity and hinders respiratory movements.[2] In a pa-

5. Levine, cited by Movitz, David, and Curtis, G. M.: Splenectomy for patients past sixty. J. Gerentology 1:303-311, 1946.
6. Ruttle, L. D.: The choice of anesthesia for the elderly patient. Geriatrics 4:25-28, 1949.
7. Weisman, S. A.: Quinidine in geriatrics. Geriatrics 4:288-289, 1949.
2. Jobson, P. L.: Loc. cit.

tient with this condition, besides the obvious dangers of anoxia, resistance to inspiration will easily cause pulmonary edema.

Anesthetic agents in themselves do little harm to these patients, but mismanagement during anesthesia and the immediate postoperative period can do much damage.

In elderly patients the thoracic cage tends to be fixed, and they depend on the abdominal muscles and the diaphragm for respiration. This results in lowered respiratory exchange and predisposes to postoperative pulmonary complications. Senile emphysema is a common condition, and although the patient is probably well accommodated, this condition should not be overlooked by the anesthetist.

Other pathologic changes common to old age include those due to deficiencies in protein and vitamin intake. The protein intake is usually low as a result of disease, lack of interest in eating, or poverty, but the active signs of protein deficiency are not usually present as a normal blood level is maintained at the expense of the tissue proteins. Often a dangerously low protein reserve will be masked by an apparently normal blood protein level in old people. Anemia is also common.

The mental state of the patient should not be overlooked in the preoperative evaluation. Tactful handling on the part of the anesthetist pays great dividends.

Preoperative Medication

The tolerance to drugs, including anesthetic agents, and shock closely parallels the lowering of the basal metabolic rate as age progresses. In planning preoperative medication and in determining dosage, the general condition of the patient, type of operation proposed, the particular surgeon, and the type of anesthesia must be considered. The effects of the sedative drugs are exaggerated in old people. Dosage should be reduced proportionately—and then a little more. The apparent body volume is often deceptive: A big man who has lost weight through aging often still appears big although he has a relatively small amount of functioning soft tissue on a large but inactive skeleton. It should be remembered that the rate of detoxication of many of these drugs is slowed owing to the lowered metabolic rate and the presence of liver and kidney disfunction. Seemingly proper doses frequently depress respiration for long periods, at times enough to interfere with the administration of the anesthetic, and in many instances predispose to postoperative complications. Although morphine is still a common choice for premedication in conjunction with atropine or scopolamine, some anesthetists do not give any opiates to patients over 70 years of age.[8] Demerol is a useful substitute for opiates as it is not so depressing to respiration and is well tolerated. The value of atropine as an inhibitor of secretions depends a great deal upon the length of time between premedication and the beginning of the anesthesia. If too little time is allowed, atropine only tends to thicken mucus that has formed, which defeats one of the purposes for which it is given. This is especially true when ether is used. The premedication should be given approximately sixty to seventy-five minutes prior to anesthesia. When spinal or local anesthesia is to be used, most authorities contend that the administration of barbiturates is indicated because of their prophylactic action in combat-

8. Knight, R. T., and Baird, J. W.: Anesthesia for the aging and aged. J. Lancet **64**:183, June 1944.

ing the toxic effects of the anesthetic agents, but here again the dosage should be reduced. In general, it might be said that the least amount of medication that can be expected to attain the desired results is the correct dosage.

CHOICE OF ANESTHETIC AGENTS

The choice of anesthetic agent and the method of administration is naturally of great importance. Ether has been a satisfactory agent in the past and is still widely used. It has been found that anesthesia may be produced by smaller amounts of ether in relation to body weight than of any other anesthetic agent. Since the introduction of cyclopropane the usefulness of ether for the elderly patient is believed by some to be steadily decreasing.[9] However, the fact that cyclopropane increases the incidence of cardiac arrhythmias should be taken into consideration when the preoperative evaluation of the patient is made.[10] Cyclopropane anesthesia has the advantages of rapid and smooth induction and prompt recovery. However, when nitrous oxide or ethylene is used as the induction agent, a rapid induction that is not unpleasant to the patient is also possible. Cyclopropane is reported to be nonirritating to the respiratory tract. It was also reported by Beecher[11] that, although ether is undoubtedly irritating to the mucous membranes, it presents a problem only during induction, and that is of no great importance. With the use of ether it is possible to use 20 per cent more oxygen than with the use of cyclopropane to produce a level of anesthesia necessary for an operative procedure that is particularly stimulating. This fact coupled with the possibility that cyclopropane may interfere with the oxygen uptake by the cells makes ether as satisfactory as if not more satisfactory than cyclopropane.[12] The administration of cyclopropane to the digitalized patient is not recommended because digitalis increases the irritability of the cardiac muscle.[2] Turville and Dripps[13] found the incidence of postoperative psychosis in elderly people was greater after the use of cyclopropane than after the use of any other agent.

The intravenous administration of pentothal sodium has been used successfully for operations of short duration and also in conjunction with local, regional block, and spinal anesthesia. Because the metabolic rate of an old patient is lowered, the amount of pentothal sodium necessary is greatly reduced. However, if the whole burden of anesthesia is placed on pentothal sodium, such toxic effects as circulatory and respiratory depression must be anticipated. Such depression, coupled with the prolonged recovery period that attends the administration of large doses of barbiturates, is to be avoided for patients of any age, but especially for old people. It should also be remembered that the margin of safety decreases with each fractional dose administered.[14] Curare is helpful in providing adequate relaxation with the use of a minimal amount of anesthetic agents. In combination with pentothal sodium the action of curare is more profound than in combination with the gases.

Regional nerve block and local in-

9. Moorhead, J. J.: Traumatic surgery and problems of old age. Am. J. Surg. 7:75-79, 1929.
10. Morton, J. J.: Surgical care of the patients in the extremes of life. Am. J. Surg. **30**:92-108, 1935.
11. Beecher, H. K.: Some controversial matters of anesthesia for thoracic surgery. J. Thoracic Surg. **10**:202-219, 1940.
12. Watts, E. H.: Anesthesia in the aged. Geriatrics **2**:88-95, 1947.
2. Jobson, P.L.: Loc. cit.
13. Turville, C. S., and Dripps, R. D.: The anesthetic management of the aged. Pennsylvania M. J. **51**:434-436, 1948.

filtration anesthesia, alone or in combination with other agents, have a definite place in geriatric anesthesia. The level of anesthesia necessary for the proposed operation should be a factor in evaluating the safety of spinal anesthesia. The seriousness of the complications that may occur is in direct proportion to the amount of autonomic and somatic nerve paralysis produced.[14] Thirty-three per cent of 448 patients having spinal anesthesia had hypotension from 60 to 70 mm. Hg in a series reported by Turville and Dripps[13] in contrast with 12 per cent who had a similar decrease in blood pressure under general anesthesia. Such complications as a decrease in blood pressure and respiratory depression are not easily remedied in patients whose compensatory mechanisms have undergone some degeneration. Spinal anesthesia for perineal and low abdominal operations appears to be well tolerated. Psychologically, elderly persons are good candidates for either spinal or local anesthesia, but there is some evidence that the incidence of reactions to local agents is higher, with more local irritation and retardation of healing processes.[13]

MANAGEMENT OF ANESTHESIA

Administration of the agent selected and management of the anesthesia are actually more important than the choice of agent. Respiratory obstruction must be avoided because of the resultant decrease in oxygen tension and increase in blood pressure, carbon dioxide retention, and release of adrenalin. A great number of these patients are partially or completely edentulous, and the response to the stimulation of inserting an oral airway is not usually so great as it is in younger persons. Intratracheal intubation is also more easily facilitated and provides peace of mind for the anesthetist, since the patient then has the best possible airway.

The comfort of the patient should be borne in mind by the anesthetist. The skin of an elderly patient is prone to break down even after short periods of continuous pressure in one area. Stirrups particularly must be well padded. Because of the inability of the aged patient's heart to adjust to sudden changes in blood volume, great care must be exercised when the patient's position is changed in such procedures as abdominoperineal resection.

"Blood and oxygen are two of the most valuable tools which the anesthetist has to support the aged patient through the ordeal of surgical treatment." The prompt and judicious replacement of blood and fluid lost and the use of oxygen are important preoperatively and postoperatively as well as during the procedure. Some anesthetists contend that oxygen should be given the first postoperative day especially to patients with cardiac disease who are in potential danger. The dangers of overhydration of the elderly patient as well as of dehydration should be emphasized. Too much fluid, too rapidly administered, is likely to cause cardiac failure and pulmonary edema.[15] Arteriosclerosis apparently reduces the reactivity of the circulatory system to sudden volume changes, and, as for all patients, it is recommended that whole blood be replaced as it is lost.

POSTOPERATIVE COMPLICATIONS

The judicious use of drugs and the observation of vital signs in

14. Rovenstine, E. A.: Geriatric anesthesia. Geriatrics 1:46-53, 1946.

13. Turville, C. S., and Dripps, R. D.: Loc. cit.

15. Martin, J. D., Jr.: Surgical risks in the elderly patient. Geriatrics 3:296-300, 1948.

the immediate postoperative period play a big part in the successful management of these patients. Elderly patients are often disoriented and sometimes difficult to manage, but care must be exercised in the amount of medication given postoperatively. The interval between doses should also be carefully gaged. Because of their slowed up reactions, any residual depression from the anesthesia may be prolonged or even increased by the administration of too much medication too soon.

Postoperative complications incident to anesthesia and the operation are usually cardiac or respiratory in nature. Cardiac failure with pulmonary edema may be precipitated by myocardial anoxia. Pulmonary edema is often related to the excessive postoperative administration of fluids.[16] In the 347 cases of aged patients studied at Strong Memorial Hospital, there were seven major pulmonary complications, or an incidence of 2.0 per cent. The total incidence of postoperative complications was 3.4 per cent. There was one reported case of uremia following an hour procedure for resection of the sigmoid. The patient recovered and was discharged from the hospital. Two cases of myocardial infarction were reported, both patients having had diagnoses of myocardial disease prior to operation. All but one of the seven pulmonary complications followed procedures of more than two hours. One operation was an esophagectomy lasting five hours and thirty minutes. This patient had congestive heart failure and had had auricular fibrillation prior to operation. A developing atelectasis was successfully combated, and the patient recovered.

16. Lundy, J. S.: Anesthesia and supportive therapy for operations on elderly patients with special reference to reduction of operative risk. Geriatrics **3**:361-363, 1948.

According to many authorities, the incidence of postoperative complications is directly related to the length of the operative procedure.

Turville and Dripps[13] reported the greatest incidence of complications with spinal anesthesia and the lowest with pentothal sodium. However, a greater number of minor operations were done under pentothal sodium anesthesia, and the incidence of complications would be expected to be less. In over 50 per cent of their total cases spinal anesthesia was used.

An analysis of the series at Strong Memorial Hospital showed that the genitourinary service reported no complications and no deaths in a total of 129 patients. In 41 per cent of these cases spinal anesthesia was used, in 25 per cent pentothal sodium and nitrous oxide and oxygen, in 17 per cent ether, and in the remainder miscellaneous combinations. Of the 52 orthopedic cases, ether was used in 63 per cent, pentothal sodium in 18 per cent, local anesthesia in 10 per cent, and combinations of local anesthesia, pentothal sodium, and ether in the rest. On this service the mortality rate was 1.9 per cent. General surgery, as would be expected, had a higher mortality rate and a higher incidence of postoperative complications than any of the other services. The mortality rate was 5.4 per cent, and 7 per cent of the 128 patients had postoperative complications. The gynecologic service with a total of 38 cases reported no deaths and no complications.

Nineteen different combinations of agents were used in this series: 37 per cent of the patients received Vinethene and ether; 18.4 per cent spinal anesthesia; 16.1 per cent pentothal sodium with nitrous oxide-oxygen; 6.6 per cent pentothal

13. Turville, C. S., and Dripps, R. D.: Loc. cit.

sodium induction followed by nitrous oxide-oxygen and ether; and 4.9 per cent local anesthesia. These five groups account for the major types of anesthesia and combinations of agents used for patients of advanced age. Since these patients are already past the average life expectancy, the operation, general condition of the patient, and duration of the operation, as well as the anesthesia, must be considered as contributory factors in the incidence of postoperative complications and deaths.

SUMMARY

A series of 347 cases of patients past 70 years of age who received anesthesia during 1949 at the Strong Memorial Hospital has been reviewed.

With a proper choice of anesthetic agents and methods, and with the recognition of complications before anesthesia is begun and the institution of measures to deal with these complications should they become exaggerated, the risk of anesthesia for the aged patient is not great enough to contraindicate almost any operation. However, the limitations of the various drugs must be taken into consideration in the selection of the agents to be used for each specific case. Because these patients are already past the age of average life expectancy and to varying degrees have degenerative disease, the postoperative complications are probably more related to the effects of age and of preoperative pathologic conditions than to the anesthesia and surgical treatment.

A. A. N. A.

Pins and Emblems

Pin $4.00

Sleeve Emblem 50

Send Money and Order to

AMERICAN ASSOCIATION
OF NURSE ANESTHETISTS

22 East Division Street
Chicago 10, Illinois

My Gift

To the Agatha Hodgins Educational *Loan* Fund

I hereby donate $_____to the Agatha Hodgins Educational Fund, which is "designed to extend financial assistance to graduate nurse anesthetists in obtaining further education and training to become qualified instructors, or to instructors who desire and need additional training to become better qualified."

Name_____

Address_____

(Checks should be made payable to: American Association of Nurse Anesthetists, for Educational Fund, and sent to: American Association of Nurse Anesthetists, 22 E. Division St., Chicago 10, Illinois.)

MECHANISMS PRECIPITATING TERMINAL CARDIOVASCULAR FAILURE IN THORACIC SURGERY
With Case Report

Barbara Van Arnam, R.N.
New Brunswick, N. J.

The thorax is essentially a chamber for the protection of the "moving parts" of the two most vital systems of the body: the circulatory and the respiratory. The function of the organs involved, the heart and the lungs, is primarily mechanical. Opening the chest wall seriously affects the function of the respiratory and the cardiovascular mechanisms and their reflexes. In this article the mechanisms precipitating terminal cardiovascular and respiratory failure during thoracic operations will be discussed in the light of the observations made in the following case study.

A girl, aged 15, was admitted to the surgical service on July 6, 1949. She did not appear acutely or chronically ill. Physical examination on July 7 revealed a well developed, well nourished girl with a history of a productive cough for several years. Inspiratory and expiratory wheezes were heard over the anterior chest, and there was a slight depression of the right side of the thorax during inspiratory movements. A diagnosis of bronchiectasis of the left lower lobe was made, and the patient was prepared for operation on July 8. Morphine sulfate, gr. 1/8, with atropine, gr. 1/150, was administered at 7:00 a. m., July 8. The patient also had postural drainage for fifteen minutes. Preoperative blood pressure was 124 mm. Hg systolic and 50 mm. Hg diastolic; pulse rate was 104 a minute; respiratory rate was 24 a minute. At 7:45 a. m. the intravenous administration of 1,000 cc. normal saline was started. The patient's color was good, although she was slightly flushed.

The administration of anesthesia was started at 8:10 a. m. Nitrous oxide-oxygen-ether was used for induction, and ether-oxygen for maintenance, with the closed carbon dioxide-absorption technic. An atraumatic intubation was performed with a Magill intratracheal tube, and the cuff was inflated. The blood pressure, pulse, and respiration showed little change during induction. Ether was given by the semiopen drop technic for ten minutes while the patient was placed in position for the operation.

The operative procedure was started at 8:50 a. m. Blood pressure was 120 mm. Hg systolic and 80 mm. Hg diastolic; pulse rate was 102 a minute; respiratory rate was 28 a minute. Atropine, gr. 1/150, was administered intramuscularly at 9:00 a. m. just before the pleural incision was made. At 9:05 a. m. the patient was placed on the Mautz respirator, and ether-oxygen by the to-and-fro carbon dioxide-absorption technic was given. The administration of whole blood was started at 9:15 a. m. To insure a quiet operative field, curare, 1/2 cc. (10 units, 1.5 mg., *d*-tubocurarine chloride solution), was given intravenously at 9:25 a. m., 1/2 cc. at 9:40 a. m., and 1 cc. at 11:05 a. m. After curare was given, respirations diminished in volume, but spontaneous respiratory activity was never abolished.

Intratracheal suctioning was carried out four times during the operative procedure to assure a completely patent airway. The patient's condition remained satisfactory throughout the operative procedure. However, a sharp increase in pulse rate from 124 to 170 a minute occurred ten minutes after the administration of atropine, and the patient's face became more flushed. The pulse rate gradually slowed and remained around 144 a minute for the last hour and fifteen minutes of the opera-

Read before the Middle Atlantic Assembly of Nurse Anesthetists, Buffalo, May 6, 1950.

tive procedure. Lower left lobectomy and lingualectomy were carried out, and closure was started at 10:50 a. m.

The administration of ether was discontinued at 11:40 a. m., and oxygen only administered by the closed carbon dioxide-absorption technic. The use of the Mautz respirator was discontinued at 11:50 a. m., and rhythmic intermittent manual pressure on the breathing bag was carried out until the pleura was sealed. During the last half hour, respirations increased in rate and volume, and then, because the patient's respiratory activity appeared adequate, only occasional assistance to breathing was given. A total of 1,200 cc. whole blood had been given.

After the wound was closed at 12:20 p. m. and as dressings were being applied, light cyanosis of the ears developed. The patient was still in the operative position, but her head had slumped toward her abdomen. To improve respirations the patient was placed in the dorsal position, and the administration of oxygen was continued with the use of intermittent positive pressure. Her color did not improve, the pulse could not be felt, blood pressure was unobtainable, and she ceased to breathe. At 12:35 p. m. the incision was reopened, and the heart was found to be at a complete standstill. The heart was massaged, and Metrazol, gr. 1½, was given intramuscularly, and adrenalin, 1 cc. of a 25 per cent solution, intravenously at the time the incision was opened. About 12:45 p. m. the heart started to beat regularly, and a pulse rate of 100 a minute was obtained. About 12:50 p. m. spontaneous respiratory activity returned at a rate of 20 per minute, but it was jerky and of irregular volume. The wound was closed, and the trachea was suctioned, without a noticeable change in color being produced. Approximately 1 dram of yellow serous material was obtained. Oxygen administration was continued.

During the afternoon the patient's condition did not change, although her pupils, which were dilated, returned to normal size without the return of the light reflex. Tremors were noted in the skeletal muscles. During the early evening her condition changed little, but her blood pressure slowly decreased. Whole blood was given intravenously. Despite frequent suctioning mucus accumulated rapidly. Her condition became progressively worse, and she died eleven hours and fifty minutes after completion of the operation.

At autopsy the principal findings were confined to the respiratory system. There were left pneumohemothorax and severe atelectasis of the left upper lobe. There were widespread focal atelectasis, recent intra-alveolar hemorrhage, severe hyperemia and edema, acute and chronic bronchitis, and tracheitis. Grossly, there was hyperemia of the brain, but this was not confirmed by microscopic examination. No morphologic change in the tissues of the central nervous system was evident.

What were the factors predisposing to this patient's untimely death? A sudden cessation of respiratory motion may be due to several causes. It may be reflex in nature, or it may be due to sudden obstruction of the airway by pus or blood.[1] In the reported case a patent airway had apparently been maintained. Therefore, the respiratory and circulatory failure was apparently due to some reflex mechanism.

It is known that patients undergoing thoracic operations are less able to tolerate hypoxia and manipulative procedures than the average surgical patient. In speaking of the causes of anoxia, which is the ultimate cause of all death, Gillespie[2] stated that we can control those which arise from "external" respiration, but when "internal" respiration (or circulation) fails, little can be done.

It has been pointed out by Maurer[3] that the most serious effects of anoxia are usually observed in the brain and myocardium. Reflexes are abolished if anoxia exists for a few seconds, and coma ensues if the cerebral circulation is interrupted for from six to eight seconds. Obviously, the period of cerebral anoxia that the brain would tolerate in the case cited had been exceeded,

1. Poppe, J. K.: Anesthesia problems in thoracic surgery. J. Am. A. Nurse Anesthetists 13:7-16, Nov. 1945.
2. Gillespie, Noel: Death during anesthesia. Anesth. & Analg. 23:131-133, 1944.
3. Maurer, E. R.: Anesthetic problems in thoracic surgery. Anesthesiology 9:183-187, March 1948.

as irreparable brain damage occurs if anoxia lasts from eight to ten minutes. When the heart ceases to propel blood, a series of phenomena develops leading rapidly to death. The aortic and pulmonary circulations fail, the systemic and coronary pressure falls to zero, and anemia of the brain and spinal cord follows immediately with ultimately fatal effects.[4]

However, on the assumption that no anoxia was present, what caused this apparently normal heart to cease functioning abruptly, and what could have prevented it? Circulatory depression may be due to traumatic shock or may be reflex in nature—the presence of concomitant signs enables one to make the diagnosis. Sudden cardiac arrest comes on without warning: The pulse and blood pressure suddenly are unobtainable, and respirations may or may not cease simultaneously. Apparently, some inefficient cardiac activity, which cannot be detected in the peripheral circulation, must be present for a brief period before this onset.

Whereas the chemoreceptors are most important to the activity of the respiratory center, the pressoreceptors are most important to the activity of the circulatory center. Nash[5] stated that "reflex cardiac arrest" is unlikely to occur in a heart that is organically sound without some predisposing factors and signs, because not only the sino-auricular node but also all parts of the heart muscle are capable of initiating rhythmic impulses in the absence of extrinsic nerve activity. He went on to state, however, that occasionally cardiac asystole is primary, owing to some obscure neurogenic factors.

Fauteaux[4] is another authority who pointed out that among other causes "reflexes of various nature" and cardiac standstill are often causes of sudden death. However, his methods of cardiac resuscitation were not remedial.

In the reported case it may be assumed that this "obscure neurogenic factor" may have originated in a slight change in position when the patient's head slumped toward the abdomen. According to Burstein,[6] a change from the horizontal to the upright position produces such a disturbance in hemodynamics that a decrease in arterial pressure at the cardioaortic and carotid sinus occurs. This reflex reaction is elicited by a physical stimulus. Here it should be noted that, when the patient was turned from the surgical position to the dorsal, the circulatory disturbances became more pronounced.

The vasomotor center, which is essentially a vasoconstrictor center, receives afferent impulses from all parts of the body, but it is influenced particularly by the special reflexes that control the heart, such as the depressor reflex from the aorta and carotid sinus and the Bainbridge reflex from the right auricle.[5] In the initial phase of shock, from whatever cause (in this case, it may be presumed to have been the surgical procedure), the carotid sinus and other pressoreceptors are important in the maintenance of cardiocirculatory efficiency. However, when the functioning of the pressoreceptors is deficient, "the phase of compensatory peripheral vasoconstriction is strikingly shortened, and the phase of arterial hypotension is quickly attained."[6] Above 200 and below 20 mm. Hg arterial pressure, reflex

4. Fauteaux, Mercier: Cardiac resuscitation. J. Thoracic Surg. 16:623-639, 1947.

5. Nash, Joseph: *Surgical Physiology* (Springfield, Ill.: Charles C. Thomas, Publisher, 1945).

6. Burstein, Charles L.: *Fundamental Considerations in Anesthesia* (New York: The Macmillan Company, 1949).

control of the carotid sinus ceases.[5]

Smith and Wilson[7] in experiments on dogs found that anoxemia and vagal stimulation may create auricular fibrillation, which leads to cardiac arrest. At the same time, Randall[8] showed the effects of sustained anoxia on dogs. In his experiments he found some dogs "more tolerant" than others to anoxia. When exposed to an anoxic state, the "more tolerant" dogs showed acceleration of the heart rate, an essentially normal mean arterial pressure, and reduction in electrical systole. Upon returning the animals to atmospheric air after the sudden crisis, there was good, but rarely complete, recovery in blood pressure, and after six to twelve hours most of the dogs passed slowly into a state of circulatory failure. The "non-tolerant" dogs, even when exposed to anoxia of less severity or for shorter periods, generally showed less increase in respiratory minute volume and a gradual decrease of mean arterial pressure during the sustained low-oxygen period.

However, on the assumption that the aforementioned patient's death was caused by a *reflex* mechanism causing anoxemia, I found in a fairly exhaustive review of the literature that disturbances in the rate and rhythm of the heart action occur frequently postoperatively. There is an uncommonly high incidence of cardiac arrhythmias after thoracic operations, for which the causes are unknown.

This was brought to the attention of Currens et al,[9] who published an account of cardiac arrhythmias after thoracic operations. They found the precipitating factors that cause auricular fibrillation are: (1) change in position, (2) irritability of the heart due to disease, (3) change in intrathoracic pressure, (4) accumulation of fluid in the chest, (5) age of the patient (all were 39 years of age or older). In one patient a change of position seemed to have initiated a fatal cardiac arrhythmia. As a means of combating these phenomena, they suggested the administration of quinidine sulfate as a prophylactic measure during the postoperative period. However, since their report, it has been proved by further investigations that this is not an "all-time safeguard."

Bifeldt-Nichols and Bawden[10] were concerned with the problem of sudden hypotension during thoracic operations that could be caused by a hypothetical nervous reflex. They disagreed with a report made by O'Shaughnessy in 1935 that stimulation of the pulmonary plexus causes a decided decrease in blood pressure and apnea, or a difference in rate of the respiration. By experimenting on anesthetized dogs they found that the pulmonary plexus does not play any role in the sudden onset of hypotension during intrathoracic operations, but that shifting of the mediastinum, with stimulation of a well recognized reflex center, such as the arch of the aorta, may have some influence in producing modifications in the blood pressure. They further stated that alterations of the blood pressure are due to mechanical impediments to the blood flow into the heart. Such procedures as packing the pleural

5. Nash, J.: Loc. cit.
7. Smith, J., and Wilson K.: Studies on the production and maintenance of experimental auricular fibrillation. Am. Heart J. **27**:176-185, Feb. 1944.
8. Randall, W. C.: Electrocardiographic changes in relation to tolerance of sustained anoxemic anoxia in dogs. Am. Heart J. **27**:234-245, Feb. 1944.
9. Currens, J. H.; White, P. D., and Churchill, E. D.: Cardiac arrhythmias following thoracic surgery. New England J. Med. **229**:360-364, July-Dec. 1943.
10. Bifeldt-Nichols, W. H., and Bawden, A. E.: Role of the pulmonary plexus in lung surgery. J. Thoracic Surg. **15**:422-429, 1946.

cavity or excessive pulling during difficult dissections likewise can produce kinking or compression of the great veins and, consequently, hypotension.

Although there is little accurate information on the cause of sudden cardiac arrest, several known factors throw some light on the problem. The ability of certain anesthetic agents to sensitize the heart to epinephrine is well known. It is a basic principle in physiology that hypoxia will sensitize the heart and increase the epinephrine in the circulating blood. Excitement also causes an outpouring of epinephrine into the circulation. Hypoxia will produce a hypersensitive carotid sinus with resultant inhibition of cardiac activity. Stimulation of the vagus nerve may have a powerful inhibitory effect on the heart. It is likely that one or more of the aforementioned factors are present in every instance of sudden cardiac arrest. Undoubtedly, there are other unrecognized factors that also play an important part in the causation of this complication.

In Ruzecke and Nicholson's[11] report on cardiac arrest under anesthesia it is interesting to note that cardiac arrest occurred near the completion of two thoracic operations, whereas in other types of operations, they found that cardiac arrest is likely to occur during the first thirty minutes of the procedure.

In a small series of experiments Cabitt et al[12] found typical electrocardiographic changes in dogs undergoing pneumonectomy. They came to the conclusion that it was unlikely that these changes were due to anoxemia, because they occurred only as the pulmonary blood vessels were being manipulated. The results of their experiments suggest that operations on the lung in man may influence cardiac action, probably through reflexes originating in the hilus of the lung. In the light of the work of these authorities, it may be assumed that the death of the patient in the case reported was due to the activation of reflexes originating in the hilus of the lung and was brought about by the sudden change in position.

There is still much to be learned about man's reflex reaction to different types of stimuli, and until we can discern exactly what predisposes to these reflex mechanisms, we can only guess at what safeguards should be used against them. Perhaps, with the use of the oxyhemograph and electrocardiograph during thoracic operations, we may find the answers to this problem and be able to prevent and treat such complications more efficiently in the future.

SUMMARY

A case of a patient who died from "sudden cardiac arrest" has been reported.

A review of different authors' views on the causes of unexplainable fatalities and an analysis of precipitating factors causing respiratory and cardiovascular failure in this particular case study are presented.

Knowledge of the complications originating in the cardiovascular mechanism that may occur during intrathoracic operations, the provision of safeguards against them, and the employment of the proper treatment for these emergencies are important factors in the administration of good anesthesia.

11. Ruzecke, E. R., and Nicholson, M. J.: Cardiac arrest under anesthesia. J. A. M. A. **135**:622-628, 1948.

12. Cabitt, H. L.; Altschule, M. D., and Zamcheck, Norman: Cardiac arrhythmias and other electrocardiographic changes during experimental pneumonectomy. J. Thoracic Surg. **12**:31-34, 1943.

ANESTHESIA FOR THE PSYCHOTIC PATIENT

Gertrude L. Fife, R.N.
Cleveland

Several months ago, after having retired as director of a large university hospital anesthesia department, I was persuaded to go to the Cleveland State Hospital to administer the anesthesia for a series of operations for revascularization of the brain performed under the direction of Dr. Claude S. Beck.[1] Thirty-four operations were completed in ten weeks. Since then, the interest in the problem of anesthesia for the operation that led me to take on the assignment has been superseded by a compelling interest in what can and needs to be done for the institutionalized patient with psychosis. Therefore I have stayed on as "part-time" anesthetist, although I do not limit my activities to anesthesia and lend a hand in the operating room as other needs arise.

The public has been deluged with articles emphasizing the worst aspects of the care of patients in mental hospitals. Anesthetists and nurses in general have the impression that working in a mental hospital is fruitless and unsatisfactory because of the lack of facilities, alleged indifference of the management, and the little benefit that will derive to the patient. I would like to help dispel that impression, for without a change in this attitude the surgical care of the patient in a mental hospital cannot and will not be improved. While it is true that many patients in the State Hospital are permanently disabled (the same may be said of any hospital for the chronically physically ill patient), we must not forget that a large percentage, 60 to 80 per cent, of patients in mental hospitals do return to society, some cured and most at least able to care for themselves.

Organization of the Surgical Department

At the Cleveland State Hospital there is one air-conditioned, well equipped operating room for major surgery and one for minor surgery. The anesthesia equipment includes a modern Heidbrink gas machine, intratracheal equipment, and the usual accessory equipment of a well equipped anesthesia department.

The surgical staff consists of one surgeon and one resident surgeon who are at the hospital every day. Visiting surgeons are available for consultation and for the performance of special operations when it is necessary. A full-time graduate nurse is in charge of the operating rooms and is responsible for the care of equipment and the preparation and sterilization of supplies for the operating rooms and the central supply room. Three attendants are being trained to alternate as circulating nurses.

1. Beck, C. S.: To be published.

The surgical department also provides occupational therapy for three patients. One cleans instruments, wraps packages for sterilization, and does routine work in the operating room. Another takes the surgeons' dictation and types the operative notes. A third takes care of the equipment in the cast room, makes plaster bandages, keeps crutches in good condition, and assists in the application of splints.

TYPES OF OPERATIONS

At this hospital, which has 2,500 patients, operations are performed three or four days a week. During the period from November 1, 1949, to June 1, 1950, 128 operations were performed including: thyroidectomy, cholecystectomy, nephrectomy, herniorrhaphy, hysterectomy (abdominal and vaginal), combined abdominoperineal resection, prostatectomy (suprapubic and transurethral), hemorrhoidectomy, repair of prolapsed rectum, and insertion of Smith-Peterson pin for fracture of the hip.

CONDITION OF THE PATIENT

Anesthesia for patients in a mental hospital differs in many respects from anesthesia for the surgical patient in a general hospital. The conditions for which operations are performed are the same, but the administration of anesthesia is often complicated by the presence of brain damage resulting from such diseases as cerebral arteriosclerosis, meningitis, encephalitis, and senile degeneration of the brain. Although the same disease complications may be encountered in the surgical patient in a general hospital, usually they have not produced mental deterioration. The effects of prolonged institutionalization and the presence of the psychosis also add to the adventure of anesthesia.

Because of the mental illness recognition of the physical condition requiring operation may be delayed, and making a diagnosis may be difficult. The psychotic patient may have pain but will not tell anyone about it. The condition may persist for days or weeks before it is recognized. A patient may be unable to describe his symptoms and to help the physician in making a diagnosis. If he is resistive, anesthesia may be required in order to make a satisfactory examination. Many tests that are valuable in the evaluation of a patient's condition cannot be made because of his refusal to co-operate. As a result, many of the patients are poor operative risks.

Fears, suspicions, and severe mental depression that rob the patient of a desire to live make the operation all the more difficult. It may be considered that convulsions and severe respiratory and circulatory disturbances may be produced readily in such patients if subjected to operation. Therefore elective surgery is often delayed. As a consequence, the patient comes to the operating room, at a later date, in poorer physical condition.

Lack of exercise, fresh air, and the incentive to be active produces debility. Many patients are also severely undernourished, not because food is not available to them but because of their lack of desire to eat. It is not uncommon for a patient to refuse food until it becomes necessary to feed him by tube or intravenous infusions.

Untidy habits and poor personal hygiene, especially of the mouth, increase the possibility of operative as well as postoperative difficulties and complications.

Preoperative Preparation

Heavy premedication for the institutionalized patient is inadvisable and usually unnecessary, because elective procedures are rarely performed on agitated and violent patients. Since most of the patients are inactive, drugs must be administered with caution. Because the margin of safety is greatly decreased and recovery is delayed if the patient is severely depressed during the operation, underpremedication is preferable to overpremedication.

Lack of sufficient trained personnel also makes it imperative that the patient be conscious when he is returned to the ward. Morphine, gr. 1/6 to 1/8, and atropine, gr. 1/150, administered one-half hour before the patient is taken to the operating room, are the drugs given for premedication in most instances. Barbiturates cause too much depression during anesthesia, and recovery is delayed. Each patient is individually appraised, and the drugs and dosages are selected according to his needs. Greater control of premedication is possible in an institution than in a general hospital because, as a rule, there is a better opportunity to know and study the "total" patient.

Anesthesia Management

While a patient may know that he is to undergo an operation, he is rarely told the exact date. Normal routines are interrupted as little as possible. For example, a patient to undergo thyroidectomy was transferred to the Cleveland State Hospital from another institution. She was on the woman's surgical division for several weeks in preparation for the operation and was allowed to attend the regular hospital dance for patients the night before the operation.

Most patients are transferred to the surgical division several days before operation. This gives them an opportunity to know the surgeon and the anesthetist, and as a result they are not among strangers when they come to the operating room.

A patient is never brought to the operating room until it is ready and preparations are made to put him on the table and start the administration of the anesthetic immediately. If the patient is from the woman's surgical ward, which is adjacent to the operating room, she is allowed to walk to the operating room and climb up on the table by herself. Every attempt is made to make the procedure as uneventful as possible. We believe this has been a great factor in eliminating struggling and disturbance in the operating room.

All types of anesthetic agents are administered except cyclopropane. In selecting the anesthetic agent, the criteria are the same as those applied in a general hospital. For most major surgical procedures nitrous oxide-oxygen-ether is the combination of choice. Curare is given when indicated and has proved to be of value in providing the desired relaxation without the administration of relaxing doses of anesthetic agents that delay recovery. However, because of the poor physical condition of some of the patients, curare must be given with caution. I have never given more than an equivalent of 4 cc. of *d*-tubocurarine chloride for an entire operation, and generally 2 to 3 cc. is adequate.

Pentothal sodium in 5 per cent solution is administered for minor surgical procedures and for operations attended by explosion hazards. It is a valuable agent in an institution where often anesthesia must be

administered for very minor procedures because of the patient's inability to co-operate. Also because of the patient's inability to co-operate, local anesthesia is rarely used, and spinal anesthesia cannot be given unless the patient receives heavy premedication, a practice that we have found inadvisable.

Pentothal sodium is used for induction of anesthesia if the patient appears to be unduly disturbed. One patient scheduled for herniorrhaphy was so distressed that he could not be put on a cart without having symptoms of incipient convulsions. By giving him a small dose of pentothal sodium, we were able to take him to the operating room without difficulty.

These patients must be approached in a quiet and unhurried but firm manner. The confidence of the patient is best obtained by treating him as a normal individual. I have found that these patients do not like to be touched. Several times when I placed my hand on the forehead of a patient going to sleep, I felt almost instantly the muscles of his body become tense. Many patients will not pay attention to what is said to them, and consequently the anesthetist must depend primarily on her tone of voice for control. They usually will respond to kindness and will do as they are told if they are not hurried or frightened.

As a rule, induction of anesthesia is not difficult. Rarely does a patient struggle while going to sleep. No restraint is used except for a strap placed loosely over the thighs.

When consideration and kindness and only the very minimum of restraint are used in the handling of the patient, very small amounts of anesthetic agents are required to obtain surgical anesthesia. The patients have little resistance to anesthesia because of their general debility and inactivity. However, unskilful management and an insensitive psychologic approach can create such metabolic disturbances, with an increase in blood pressure from the outpouring of epinephrine, that large amounts of the agents are required for induction. The attendant depression, once the effect of the epinephrine wears off, makes it difficult to prevent overanesthetization, respiratory and circulatory depression, and shock.

One of the greatest dangers during anesthesia is the presence of foreign bodies in the mouth and undigested food in the stomach. It is difficult to get a patient to open his mouth for inspection, and even though he does, objects may be hidden in the cheek. Although a patient is not supposed to have food the morning of operation, he may take it from the tray of another patient, or another patient may give it to him. For this reason suction must always be readily available.

POSTOPERATIVE COURSE

Postoperatively, the patients require few sedatives and become active in a relatively short time. Certain patients after herniorrhaphy have moved with little assistance from the cart to the bed without showing discomfort. As a rule, the patients are contented on the surgical ward and seem to appreciate the individual attention given them.

Penicillin is given almost routinely postoperatively because it is often difficult to prevent the patient from handling or even removing the dressing. Probably as a result of the administration of penicillin and the early ambulation of the patients, pneumonia is a rare postoperative complication.

Dental Anesthesia

Some of the patients having teeth removed will not co-operate if local anesthesia is used, and general anesthesia is necessary. One day a week patients requiring general anesthesia for the removal of teeth are operated on in the institution's dental department before the general surgical schedule is started.

We have two dental interns. One intern performs the extraction under the supervision of the dentist in charge of the department or a consultant, while the other gives the anesthetic under the supervision of the anesthetist. A full-time graduate nurse is also employed in the department.

When general anesthesia is necessary, breakfast is withheld, and usually nembutal, gr. 1½, is administered by mouth and atropine, gr. 1/150, hypodermically in order that the patient may be brought to the dental department without difficulty.

Formerly, nitrous oxide-oxygen with a small amount of ether was given on the assumption that this with the premedication would provide sufficient anesthesia. However, when the mask was applied to the patient's face, he would become unco-operative, and in several instances we had patients who put up a violent struggle. Thus, to protect the patient and ourselves, restraint had to be applied before anesthesia was administered. Since the use of restraint is not only undesirable but detrimental to the patient and a hazard in the administration of anesthesia, a new technic was developed that has proved very satisfactory.

The patient is placed in the dental chair, and if possible the dentist examines the mouth. No restraint whatsoever is used. The patient is then told that we are going to "stick a needle in his vein." He is familiar with this procedure because all the patients have blood studies and are given medication intravenously. Some patients will even point out the easiest vein to get into. Pentothal sodium, 5 per cent solution, is then given until the patient is barely able to talk. The average dose is 3 cc., and never more than 5 cc. is given. The mouth gag is then inserted, and the administration of nitrous oxide-oxygen started. No time can be wasted in inserting the mouth gag and in beginning the administration of nitrous oxide and oxygen; otherwise the value of the administration of pentothal sodium will be lost. If it is difficult to maintain anesthesia with nitrous oxide-oxygen, especially for a difficult extraction, ether is added to the mixture. Cyanosis is never allowed to develop.

The patient awakens almost immediately after the operation is over. He is allowed to walk out into the hall and sit or lie on a bench until he is fully awake and the dentist has had an opportunity to check for bleeding. Within fifteen minutes the patient, with an attendant, is able to walk back to the ward.

In dental extractions, as in general surgery, there is always the danger of foreign bodies in the mouth and undigested food in the stomach. On inspection of the mouth of one patient, the dentist found a wad of chewing tobacco as large as a walnut. Consequently, every precaution must be taken to prevent accidents. Suction is always available. Because the throat reflexes should not be abolished until the dentist has had an opportunity to examine the patient's mouth, only enough pentothal sodium is given to make it difficult for the patient to talk.

(Continued on page 294)

AN ANALYSIS OF ANESTHESIA SERVICE IN THE UNITED STATES FOR 1949

Virginia S. Thatcher, B.S.
Chicago
and
Myra Van Arsdale, R.N.
Cleveland

To prove that there is a great shortage of anesthetists and that anesthetists, administrators, and surgeons should pull together to make anesthesia service function, it has been customary to estimate the need for anesthesia service by dividing the total number of registered hospitals in the United States by the total memberships of the American Society of Anesthesiologists and of the American Association of Nurse Anesthetists. For example, in 1949 there were 6,572 registered hospitals (American Medical Association statistics) and a combined membership of the two societies of 7,502. Roughly estimated, then, there was a little better than one qualified anesthetist per hospital. Rough estimates have also been made of the number of operations performed and hence the number of anesthesias administered in registered hospitals throughout the United States during the period of a year. The usual estimate is about 50 per cent of admissions. Such estimates may serve a purpose in counteracting unfavorable publicity, but they do not help responsible persons come to grips with the hospitals' problem of obtaining qualified anesthetists to administer anesthesia. In other words, no critical study has been made of the actual demand for anesthesia service, the actual number of qualified anesthetists available, where they are working, and the weaknesses in the service.

For such a study data were obtained from a questionnaire sent to 4,604 members of the American Association of Nurse Anesthetists on January 23, 1950. Of the 2,334 replies received, 45 were from members outside the continental United States, and 11 were too incomplete to be used. This left 2,278 questionnaires from nurse anesthetists within the United States to be analyzed. To supplement these data statistics were also used from the *American Hospital Association Directory for 1950*, the *Membership List of the American Society of Anesthesiologists for 1949*, the hospital number of the *Journal of the American Medical Association* for May 6, 1950, and the internship and residency number of the *Journal of the American Medical Association* for April 15, 1950.

DEMAND FOR ANESTHETISTS

The first premise examined was that in 1949 there were 6,572 registered hospitals in the United States (American Medical Association statistics) making equal demands on the supply of anesthetists. If the demand of these hospitals for anes-

thetists were equal, one would expect to find a percentage-wise correlation between distribution of hospitals, distribution of nurse anesthetists, and distribution of operations. The fact is that no such correlation exists. Seventy-two per cent of hospitals are general hospitals and 28 per cent nongeneral hospitals. Table 1, showing the distribution of the 1,108 hospitals covered by the A.A.N.A. questionnaire, reveals that 91 per cent were general hospitals classified as offering complete service and only 2 were general hospitals classified as offering incomplete service. (Three per cent were unclassified, i.e., not in either the American Medical Association or the American Hospital Association listings.)

Table 1.—Types of Hospitals Covered by A.A.N.A. Questionnaire

General, offering complete service	1,006	(91 per cent)
General, offering incomplete service	2	
Unclassified	33	
Mental	19	
Tuberculosis	10	
Orthopedic	8	
Children's	7	
Maternity	6	
Ear, nose, and throat	6	
Industrial	5	
Cancer	3	
Osteopathic	2	
Dental clinic	1	
Total	1,108	

Confirming this lack of correlation were the projected statistics on operations published in the *American Hospital Association Directory for 1950* (table 2): Only 6.4 per cent of operations were performed in tuberculosis, mental, and long-term general and special hospitals. These statistics suggest that the problem of anesthesia service is almost exclusively one of the general hospitals offering complete service, of which there were 4,618 by actual count of the *Journal of the American Medical Association* listing for May 6, 1950.

Anesthetists Available

To find out the exact number of qualified nurse anesthetists available for administering anesthesia in the United States, a percentage distribution was made of the 2,334 A.A.N.A. questionnaires returned by members within the continental United States, and the results were projected for the total membership for 1949 (table 3).

Table 2.—Operations (projected) for 1949 According to Type of Hospital*

		Operations	
Long-Term Hospitals			
Tuberculosis	414	260,478	6.4 per cent
Mental	507	118,471	
General & Special	395	170,219	
Short-Term General and Special Hospitals			
Under 50 beds	2,091	785,009	9.2 per cent
50-99 beds	1,053	1,220,610	14.3 per cent
100-249	1,043	2,919,518	63.1 per cent
250 beds and over	398	2,478,430	
Federal	376	597,846	7.0 per cent
Total	6,277	8,550,581†	

*American Hospital Association Directory for 1950.

†The *Directory* states on page 17: "If these 'reported' figures are projected to cover 6,277 hospitals, it may be calculated that more than 9,000,000 operations of all kinds were performed in all hospitals during the year."

TABLE 3.—ANALYSIS OF MEMBERSHIP OF THE AMERICAN ASSOCIATION OF NURSE ANESTHETISTS FOR 1949 WITHIN THE CONTINENTAL UNITED STATES

		Per cent
*Full-time hospital anesthetists	3,133	69
Retired	636	14
Office anesthetists	273	6
†Free-lance anesthetists	136	3
Part-time anesthetists	136	3
Anesthetists doing other work	136	3
Dental anesthetists	91	2
TOTAL	4,541	

*4 per cent of these (125) did other work in addition to anesthesia.
†This figure is a minimum; because of an alleged threat to the free-lance anesthetist, a small percentage of returns was undoubtedly received.

The membership list of the American Society of Anesthesiologists for 1949 was also analyzed to determine the availability of physician anesthetists within the continental United States (table 4). As these tables show, there were not 4,604 members of the American Association of Nurse Anesthetists and 2,898 members of the American Society of Anesthesiologists available to administer anesthesia in hospitals within the continental United States last year. When foreign members, retired members, dental anesthetists, honorary members, and persons holding membership but doing other work are excluded, 3,678 nurse anesthetists, or 81 per cent of the A.A.N.A. membership, and 1,837 physician anesthetists, or 63 per cent of the A.S.A. membership, were available for full-time or part-time hospital anesthesia service. The combined figures total 5,515 anesthetists.

There are undoubtedly a number of competent anesthetists who do not belong to either of these associations that limit membership to those qualified by training to administer anesthesia. On the other hand, member nurse anesthetists and physician anesthetists in supervisory, research, and teaching positions administer very few anesthesias.

ANESTHESIAS ADMINISTERED

The number of hospitals making the major demand on available qualified anesthetists and the number of qualified anesthetists available mean little unless the number of anesthesias administered is known. To this end, statistics on operations and births as reported by the *American Hospital Association Directory for 1950* were projected, and the ratio of operations and births to admissions was computed (table 5). The ratio of admissions to anesthesias in those hospitals offering anesthesiology residencies (*J.A.M.A.* for

TABLE 4.—ANALYSIS OF THE MEMBERSHIP OF THE AMERICAN SOCIETY OF ANESTHESIOLOGISTS FOR 1949

Junior members (students)	688	(75 foreign)
Associate members (dentists)	58	
Honorary members	23	
Foreign members	292	
Active members in the U. S.	1,837	
TOTAL	2,898*	

*476 were diplomates of the American Board of Anesthesiology; 12 of these were in Canada.

Table 5.—Percentage of Admissions Requiring Anesthesia Service in Hospitals in the United States in 1949

American Hospital Association Directory	*Admissions*	*Operations*	*(Projected) Births*	*Anesthesias*	*Per Cent of Admissions*
6,277 hospitals	17,821,765	8,550,581			48
4,585 short-term general hospitals			2,967,558		
				11,518,139	65
J.A.M.A. for April 15, 1950					
*163 nonfederal hospitals offering anesthesiology residencies	1,958,739			1,099,655	56
* 39 federal hospitals offering anesthesiology residencies	377,844			179,214	47
A.A.N.A. questionnaire					
*820 general hospitals	4,905,514			2,532,050	52

*Hospitals on which data were complete and seemingly reliable.

April 15, 1950) and in those hospitals covered by the A.A.N.A. questionnaire was also determined (table 5). In estimating the anesthesia requirements for obstetrics, the American Hospital Association statistics on births for short-term general hospitals only were projected, because of the possibility that only those hospitals in the other categories reported births that had births. As this figure does not include births in the other categories of hospitals, it is minimal. Table 5 shows that for 1949 the estimated total anesthesias, including obstetric anesthesias in general short-term hospitals only, amounted to 11,518,139, or 65 per cent of total admissions in registered hospitals throughout the United States.

There are two explanations for the discrepancy among the ratio of anesthesias to admissions in nonfederal hospitals offering anesthesiology residencies (56 per cent), in hospitals covered by the A.A.N.A. questionnaire (52 per cent), and in the total hospitals in the United States as reported by the American Hospital Association (65 per cent). In hospitals offering anesthesiology residencies, the surgical services would be expected to be larger than those in the average hospital as represented by the returns to the A.A.N.A. questionnaire. In addition, the A.A.N.A. questionnaire revealed a major neglect of obstetric anesthesia service in many of the hospitals from which returns were received. It may be assumed that, in many of the hospitals reporting the number of anesthesias administered, obstetric anesthesia is the stepchild of the anesthesia department and accurate records are not kept. From returns from 56 hospitals in which the surgical and obstetric anesthesias were reported separately, 30 per cent of the anesthesias were for obstetrics. This correlates with a similar computation using statistics of the American Hospital Association.

Anesthetists Needed

To determine the number of anesthetists needed to administer 11,-

TABLE 6.—ANESTHESIA PERSONNEL IN 1,108 HOSPITALS IN WHICH A.A.N.A. MEMBERS WORKED IN 1949*

	Hospitals	*Per Cent*
Nurse anesthetists		
A.A.N.A. members	1,108	100
A.A.N.A. nonmembers	338	30
Medical anesthesiologists	389	35
Physician anesthetists	337	30
Student nurse anesthetists	86	8
Interns	127	11
Residents	188	17
Others (medical students, nurses, nurses' aides and practical nurses, lay persons, and osteopaths)	97	8

*Does not include hospitals where general practitioners, surgeons, and dentists also administered anesthesia.

518,139 anesthesias, the country-wide average of anesthesias administered by nurse anesthetists was computed from 1,420 questionnaires reporting what seemed to be reliable statistics. This average for 1949 was 685 anesthesias per nurse anesthetist.

If 11,518,139 anesthesias were administered in 1949 and if an anesthetist on the average administered 685 anesthesias during the year, 16,815 anesthetists were needed to do the work. We can account for only 5,515 who were qualified by membership in the American Society of Anesthesiologists or the American Association of Nurse Anesthetists. In other words, less than a third of those needed were available.

Every year about 230 anesthesiology residents and about 500 nurse anesthetists enter the field. If the needs of anesthesia service remained static and if the attrition rate for anesthetists were zero, it would take fifteen years before a supply could be built up to meet the demand.

From the records of 130 candidates taking the last A.A.N.A. qualifying examination for membership, it was found that the average case lasts one hour and two minutes. If an hour is the average time required for the administration of an anesthesia, the average anesthetist is putting not quite fourteen hours a week into the actual administration of anesthesia. Although anesthesia time is no measure of the actual work done by an anesthetist and does not include the preparation and care of supplies and the preoperative and postoperative care of the patient, it is revealing that almost two thirds of an anesthetist's time is spent on auxiliary duties.

Who, then, administered the anesthesias, and where was the anesthesia service weakest?

Table 6 shows the percentage of hospitals using various types of personnel to administer anesthesia. It must be recognized that all these hospitals had qualified nurse anesthetists in their employ, either as full-time or part-time workers, and the statistics should not be interpreted as being representative of all hospitals. However, that 8 per cent of these hospitals were using unqualified persons to administer anesthesia shows that the problem of anesthesia service coverage is far from being a matter of nurse anesthetists and/or medical anesthesiologists. In these hospitals 17 per cent of staff nurse anesthetists and 26 per cent of free-lance nurse anesthetists were not members of the American Association of Nurse Anesthetists.

Table 7.—Distribution of 4,618 General Hospitals Offering Complete Service, of Nurse Anesthetists in Those Hospitals, and of Operations and Births in 4,585 Short-term General Hospitals

A. Distribution of Hospitals—*J.A.M.A.*, May 6, 1950

Bed Size	*Hospitals*	*Per Cent of Total*
1-50	2,117	46
51-100	985	21
101-200	788	17
201-300	354	8
300 and over	374	8
Total	4,618	100

B. Distribution of Nurse Anesthetists—A.A.N.A. Questionnaire

Bed Size	*Hospitals*	*Per Cent of Total*
1-50	148	15
51-100	232	23
101-200	297	29
201-300	158	16
300 and over	171	17
Total	1,006	100

C. Distribution of Operations (projected)—*A.H.A. Directory for 1950*

Bed Size	*Short-term General Hospitals*	*Operations*	*Per Cent of Total*
1-50	2,091	785,009	11
50-99	1,053	1,220,610	17
100-249	1,043	2,919,518	39
250 and over	398	2,478,430	33
Total	4,585	7,403,567	100

D. Distribution of Births (projected)—*A.H.A. Directory for 1950*

Bed Size	*Hospital*	*Births*	*Per Cent of Total*
Under 50	2,091	476,749	16
50-99	1,053	539,325	18
100-249	1,043	1,129,694	38
250 and over	398	821,790	28
Total	4,585	2,967,558	100

A summarizing correlation was made of the distribution of 4,618 general hospitals offering complete service, of nurse anesthetists in those hospitals, and of operations and births in 4,585 short-term general hospitals to find out whether any size of general hospital was being neglected with respect to anesthesia service (table 7).

Although the greatest percentage of hospitals were 1 to 50 beds (46 per cent) and although only 15 per cent of those hospitals were covered in the replies to the A.A.N.A. questionnaire, only 11 per cent of operations and 16 per cent of births were in that size hospital. At the other end of the curve we find that 33 per cent of hospitals were over 100 beds, but that 62 per cent of these hospitals were covered by replies to the A.A.N.A. questionnaire, and that 72 per cent of operations and 66 per cent of births were in these hospitals.

Supervision of Anesthesia Department

The Principles of Relationship between Hospitals and Radiologists, Anesthetists, and Pathologists recommends that, except in unusual circumstances, the anesthesia de-

TABLE 8.—DURATION OF EMPLOYMENT OF NURSE ANESTHETISTS ON PRESENT AND PREVIOUS JOBS

Present Position—1,800 nurse anesthetists reporting									
Years	1	2	3	4	5	10	15	20	25
Per cent	31	15	11	8	17	6	4	5	3
Previous Position—1,376 nurse anesthetists reporting									
Years	1	2	3	4	5	10	15	20	25
Per cent	33	16	14	8	18	7	2	2	1

partment should be under the direction of a qualified anesthesiologist or member of the medical staff with a special interest in anesthesia. To find out how closely the standard was being adhered to, the A.A.N.A. questionnaire asked the question: "Who is in charge of the anesthesia department?" In the 1,013 hospitals covered by the questionnaire, 482 departments, or 48 per cent, were headed by physicians (anesthesiologists, physician anesthetists, surgeons, or medical directors); 457 departments, or 45 per cent, by nurses; 28 departments, or 3 per cent, by hospital administrators; and 46 departments, or 4 per cent, had no head.

TENURE OF ANESTHETISTS

Another aspect of anesthesia service is the length of tenure of the anesthetist. A complaint made by hospital administrators is that anesthetists, both physician and nurse, have uncommendable migratory habits. From the A.A.N.A. questionnaire we learned that there is some truth to the contention in the first several years of a nurse anesthetist's employment, but that is not the whole story.

Table 8 shows the percentage of anesthetists holding the same job one, two, three, four, five, ten, fifteen, twenty, and twenty-five years. While the largest percentage of anesthetists had held previous and present jobs for only one year, the next largest percentage was in the five year category. Since approximately 500 student nurse anesthetists are graduated each year, at least one third of the anesthetists in the one year categories may be assumed to be new to the job.

COMMENT

In 1949 there were less than one third the number of qualified anesthetists needed to cover the anesthesia services in hospitals in the United States. The first need is obviously for more training programs for anesthetists. Whether or not the cost of anesthesia service is greater in the hospital that has a training program than in the one that has none is controversial. Anyone undertaking to get at the facts would encounter difficulty because of the reluctance of hospitals to answer questions about money. That does not say, however, that such a study would not be valuable.

The suggestion that central schools for teaching theory to nurse anesthetists should be established has been made time and time again, and once an accreditation program based on a sound curriculum is in operation, the establishment of central schools would seem to be the next step. The American Association of Nurse Anesthetists is concerned about the number of small schools that have sprung up in the effort of hospitals to cover the schedules. It is highly unlikely that the students are getting the proper theoretical training in these hospitals, but until an accreditation pro-

gram is in operation, and all schools are inspected, proof of this contention is lacking. However, with the establishment of central schools, small hospitals could be supplied with students on a rotating internship basis, and eventually a pool of anesthetists would be built up that would more adequately supply the demand.

Since present methods of building up the supply of anesthetists are obviously inadequate, the feasibility of routinely training medical students and interns with no particular interest in anesthesia might well be re-evaluated. For if the aim is to provide anesthesia service by qualified anesthetists in every hospital, the training of medical students and interns in order to cover the service is no less than wasteful, when the same time and clinical material could be used to train professional anesthetists and surgical residents.

As was previously stated, the A.A.N.A. questionnaire showed a disturbing neglect of obstetric anesthesia. It was in obstetric anesthesia that most of the unqualified persons were working. The attitude of the professional nurse anesthetist is that an anesthetist should be trained to do all types of anesthesia and that obstetrics is part of the total job. However, many with this attitude refuse to take obstetric call unless the case is particularly difficult because the burden of the regular anesthesia schedule is too great. At the same time they object to the training of obstetric nurses in anesthesia; the nurse partially trained in anesthesia is not much better than the one with no training, and there is the danger that she may wander incompletely qualified into the field of surgical anesthesia. The attitude is a proper one, but it does not solve the problem. If nurses and others are used to administer obstetric anesthesia, rigid supervision of their work should be enforced. A better solution during the present shortage of anesthetists would be to relieve the qualified nurse anesthetist of ancillary duties so that more time might be given to the actual administration of anesthesia. If it is the policy of the medical school or hospital that residents in obstetrics and surgery should receive some training in anesthesia, they should get it during the day, when they are most likely to be supervised, and not on obstetric call. Some hospital anesthesia departments staffed by physicians hire nurse anesthetists to give obstetric anesthesia only, which is a reflection of their attitude toward this important phase of the service.

It was previously stated that the average anesthesia time for an anesthetist is not quite fourteen hours a week, exclusive of the time spent in the care of equipment, preoperative preparation, and preoperative and postoperative care. There are a number of possible reasons for this poor utilization of an anesthetist's ability: Time wasted while the anesthetist waits for the surgeon, the surgeon who will have only one anesthetist administer anesthesia for him, surgeons and anesthetists who don't get along, and inefficient scheduling of cases are factors that might bear investigation. With the co-operation of the surgical staff in keeping to schedules and in having patients ready for the operation when they come to the operating room, many hours of an anesthetist's time might be saved.

The high percentage of anesthetists with an employment record of only one year, even when the new recruits to the field are excluded,

testifies to the unsettled habits of certain young anesthetists. But we also have evidence that certain hospitals as well as anesthetists deserve to be put on the black list. To stabilize anesthetist service, the hospitals need to scrutinize their personnel policies *and* their personnel. One person, and it is not necessarily the operating room supervisor, can raise havoc with an entire department. Salary and maintenance are not the only or the most important considerations in keeping anesthetists. There have been jobs going begging that have offered $400 a month and maintenance. It is not to be expected that a hospital wanting trained nurse anesthetists for obstetric anesthesia only will have much success in getting or keeping personnel. A hospital that provides miserable living quarters would do well to spend a little money in redecorating and save it in the rapid turn-over of anesthetists. The A.A.N.A. is trying to impress on its members their responsibilities as employees, but hospitals have to keep up their end as well. A hospital that has a record of keeping over 20 per cent of its staff less than a year should examine its policies before putting the entire blame on the anesthetists.

SUMMARY

The problems of anesthesia service coverage are complicated by local and regional conditions, and it would be foolish to attempt to formulate a policy to fit every hospital situation. The type of surgery done in the hospital and the relative powers of the head of the anesthesia department, the administrator, the surgeons, and the board of trustees limit what any one of them can do to improve the service. However, the need for improvement and the dissatisfactions with current conditions are great enough for all persons involved to give and take in a realistic effort to make anesthesia service function.

With co-operation among hospital administrators, medical anesthetists, nurse anesthetists, and surgeons the road could be paved for more hospital anesthesia departments to be headed by qualified physicians and also for a similar better utilization of the ability of nurse anesthetists by their employment in hospitals where the doors are now closed to them. With co-operation it is not impossible to conceive of central schools for providing theoretical training in anesthesia and the establishment of rotating internships in hospitals unequipped to conduct schools but rich with clinical material. However, before there will be co-operation, physician anesthetists must have an honest respect for their nurse co-workers and not a mental reservation that they are inferiors to be tolerated because it is the hospital's policy to employ them. At the same time nurse anesthetists must have the same esteem for physician anesthetists that they have for surgeons and not belittle the physician for choosing a field that nurses have been able to enter with fewer qualifications.

With the ever present shortage of qualified anesthetists, anesthetists themselves, as well as department heads, administrators, and surgeons, need to discover ways for the better utilization of working hours on the anesthesia service.

That less than one third of the qualified anesthetists needed were available in 1949 is a significant indication of the direction anesthesia service in the United States is headed unless a halt is called by those whose responsibility it is.

PSYCHIATRIC ASPECTS OF ANESTHESIA

F. Gordon Pleune, M.D.*
Rochester, N. Y.

The subject, psychiatric aspects of anesthesia, does not lend itself easily to brief and simple discussion. At the outset, I must say I feel that in the past two or three decades psychiatric aspects of anesthesia have been considered all too briefly by your highly skilled and rapidly advancing profession. It seems to me that this subject is of basic importance in anesthesia, and in this short time today I hope that at least I may be able to make the subject seem worthy of your further interest and study.

When it came time to think of what to say here, I submitted to the traditional impulse of all speakers: I went to the library to find in books some time-honored words of wisdom that had been written on this subject.

I soon found shelves full of impressive books. A search of the table of contents and the index in *Clinical Anesthesia*,[1] a recent, fairly thick textbook, failed to reveal even the words psychiatry, psychology, or psychologic factors. I looked under nervous system, nervousness, etc., and found nothing pertaining to this subject. Somewhat surprised, I looked for a chapter, or at least a few pages, on the anesthetist-patient relationship, fear of anesthesia, or neurotic reaction to anesthesia—and found no such heading. By this time, puzzled but undismayed, I came upon the section called preanesthetic care and medication. In this section is recorded, in the most elaborate, painstaking detail, suggestions as to what ought and what ought not to be done *physically* for the patient to avoid trouble. All is made clear—from the tender care and preparation of his bowels to the protection of his hair and the proper length of his fingernails to prevent scratches. "The patient should be brought to the operating room without exciting him if possible. Before the patient leaves his bedroom, the floor nurse should remove jewelry, artificial teeth if they are removable or any foreign bodies the patient has loose in his mouth. The patient should wear enough night clothes, socks, dressing gown, slippers, and so forth, to be comfortable and the floor nurse should see that no extra clothing is left in the operating room, for in a busy operating room suite, clothes and valuables may be lost. Sometimes the transfer of the patient from his bedroom to the operating suite can best be accomplished with a wheel chair and sometimes with a hospital cart. The patient should be protected against drafts and against being chilled. His stay in the waiting room of the operating suite should not be long. A stay of

---

Read before the Middle Atlantic Assembly of Nurse Anesthetists, Buffalo, May 26, 1950.

*Instructor and Assistant Psychiatrist, Department of Psychiatry, University of Rochester School of Medicine and Dentistry and Strong Memorial Hospital and Rochester Municipal Hospital.

1. Lundy, J. S.: *Clinical Anesthesia* (Philadelphia: W. B. Saunders Co., 1942).

ten to fifteen minutes is optimal." In contrast to this impressive list of precautions, only *one sentence* directly pertains to the patient's psychologic status. "Preliminary medication is valuable in bringing the patient to a condition of quietness and complacency *which eliminates so far as possible* the apprehension, fear, and resistance to anesthesia which are only too apparent in many patients unless sedatives have been used." (Italics mine.)

This supreme and somewhat naive confidence in the use of drugs for controlling or modifying human behavior might be called the fallacy of the "Drug Age" in medicine. Too often, drugs are modern, streamlined substitutes for understanding and wisdom about human behavior —what used to be called the *art* of medicine.

In the light of modern psychiatry understanding and modifying human behavior is not simply an art—an intuitive, mystical ability that some persons have and some don't—but a science, the study of which will increase our knowledge of man. In other words, the so-called art of medicine should become a part of the science of medicine so that the dominance of uncomprehending, emotional *re*-action can be replaced by reasonable and intelligent action.

It is generally accepted that man possesses reason and intelligence as well as emotions. We have used reason and intelligence extensively in studying and mastering our external environment. The physical sciences have progressed enormously, to such an extent that many persons are frightened by this atomic age. But we have been peculiarly slow or unwilling to apply the same powers of scientific reasoning and intelligence to the study of man's emotional structure and behavior.

This whole area is often just called "human nature," which is marveled at, joked about, deplored, ridiculed, and sadly considered to be impervious to change. Psychiatry holds that by the use of reason and scientific study greater understanding of psychic functions (human nature) is possible, and that this can bring about more intelligent action. On this basic principle—that human behavior is to a great extent understandable *and* modifiable—psychiatry is proceeding, humbly recognizing the complexities and difficulties of its task and realizing that there is much we do not yet know.

It is noteworthy that the older textbooks on anesthesia contain more discussion of psychologic factors than many recent ones. This earlier interest and awareness has perhaps been replaced by a greater faith in drugs to handle anxiety and fear. I consulted other books, many of them, including Paluel J. Flagg's book *The Art of Anesthesia*,[2] first published in 1916. This contains various bits of superficial but sensible advice that add up to saying "be sympathetic to the patient, try to win his confidence."

Thinking that perhaps a book on local anesthesia might deal more extensively with the matter of psychic problems, I looked through Hertzler's book entitled *The Technic of Local Anesthesia*.[3] Under "General Preparation of the Patient" the following statements appear: "It is desirable that any patient about to undergo an operation should have his mental and physical equipoise disturbed as little as possible. This is doubly important if the operation is to be under local anesthesia. Unless some special indication exists

2. Flagg, Paluel J.: *The Art of Anesthesia* (Philadelphia: J. B. Lippincott Co., 1939).
3. Hertzler, Arthur E.: *The Technic of Local Anesthesia* (St. Louis: C. V. Mosby Co., 1941).

no great departure from normal living is required. A full bath, a restful night's sleep and a normal bowel movement are all the general preparation that is required." Then under "Special Preparation" this technical advice is given: "Before the initial injection is made, the patient should be told that the first prick of the needle will cause about as much pain as the giving of an ordinary hypodermic injection. One of my patients estimated the pain as about 'two mosquito power.' I have used this expression with advantage to the mental poise and comfort of other patients. This forewarning prepares him for the slight pain. It is remarkable how far minute detail goes toward gaining the confidence of the patient and establishing his faith in the success of the procedure. If the initial prick causes the patient to scream with pain, the operator has an indication of the state of his mind, and renewed efforts must be made to gain his cooperation." No further discussion is devoted to what the renewed efforts might be.

As a final example, I quote from a British book written by C. L. Hewer some eighteen years ago and called *Recent Advances in Analgesia and Anesthesia*.[4] In a chapter called "The Personal Factor, Use of Suggestion" the author states: "An anesthetist may have the most perfect knowledge of the latest theories and also the highest technical skill and yet be a failure in his profession. The reason is, of course, that Anesthesia is an art as well as a science, and a man may simply be a trained scientist, regarding his patients as 'cases' while knowing nothing of what may perhaps be most aptly described as 'bowels of compassion.' The patient rightly regards a serious operation as one of the most important events in his life, and not only appreciates real kindness and sympathy from his anesthetist, but is also in a state which readily responds to suggestion." This chapter consists of two full pages! (out of 272)—the most exhaustive and prolonged discussion of psychologic matters I found in any of the ten or twelve books that I looked through rather carefully.

I have mentioned these books not to deride or to criticize them but to point out as a simple fact that very little is written about psychologic factors in anesthesia that even remotely approaches the very excellent, complete, highly developed knowledge of chemical, physiologic, and technical factors in anesthesia.

The brief and rather superficial treatment of the anesthetist-patient relationship is, I believe, due not so much to the feeling that it is unimportant as to an assumption that everybody intuitively knows about it, that the "psychology of the situation" is rather self evident, and that by virtue of having lived to maturity and having had a certain number of experiences one knows how to behave with patients. There is at times a curious complacency about or even resentment of the implication that one might be ignorant of or mistaken about the proper psychologic treatment and understanding of patients.

It is true that many persons, including some anesthetists, are intuitively rather good psychologists or psychotherapists without being urged or taught to be. These rare and gifted individuals act wisely without actually knowing what they do or why. But our purpose here is to try to understand specifically the anesthetist-patient relationship, since this should be not just an automatic interaction but a proper

4. Hewer, C. L.: *Recent Advances in Analgesia and Anesthesia* (Philadelphia: The Blakiston Co., 1937).

subject for scientific study. Increased knowledge of this subject can result in improved technic, just as increased knowledge of physical and chemical factors results in improved technic.

I need not remind you that the situation of undergoing anesthesia is a very unusual one in a person's life experience, as it involves the complete submission of one human being to the complete dominance and control of another. For some persons this passive surrender of even the safety of one's life to another person is relatively easy, while for others it may be laden with tremendous anxiety that compels them to fight against it, even though they consciously want to co-operate. Persons who are very trusting, who have had good relationships with powerful and superior figures, such as parents, teachers, bosses, superior officers, and religious leaders, are in general able to approach the anesthesia situation more realistically with less dread and emotional struggle than those who are *unconsciously* aggressive, hostile, suspicious, and insecure.

I emphasize the word *unconsciously* because it is important to realize that the breath-holding, shouting, struggling patient is not doing this deliberately and voluntarily. You may say, "That is nothing new or surprising; I have always known that." Perhaps so, but there is a great tendency to forget what one knows in times of stress and then *to feel* that the patient is being unco-operative or obstructive, that his behavior is more or less a personal affront, and that he is stubborn, mean, and inconsiderate, i.e., a bad patient. You have then made a moral judgment of him, which is not properly a part of your scientific work. Your attitude is important and should be based on a deep understanding of the situation rather than on an emotional reaction to it. Confronted with anesthesia and surgery, the average person is on the brink of a new and unknown human experience. Even at best, considerable anxiety and uncertainty are inevitable. To be completely overpowered by a relative stranger, whose hands for a time hold absolute control over life or death, is not easy to face with equanimity. The patient's state of mind depends not only upon how well you run your machine or prepare your syringe and needles, but also upon how well you can bring about between yourself and the patient an atmosphere of confidence, trust, and security.

There is a great tendency on the part of many professional persons to take a God-like attitude toward their clients, customers, or patients. In saying this I include many physicians, and at this moment I refer also to some anesthetists. With our special knowledge, our long years of unique and difficult training, our allegiance to a special discipline with its heavy responsibility and almost sacred routines, we may unwittingly slip into an aristocratic, down-the-nosish, superior attitude toward the average patient. A peculiar air of haughtiness and mystery surrounds the personnel in many operating rooms. There is a tendency to regard patients almost as a different species, and a rather inferior species at that. They are too often treated with an aloof and rather weary tolerance and are spoken of as if they were pieces of material to be processed in a scientific, sterile shop. Typical operating room slang, such as "Dr. Green's hemorrhoid is ready," or "Who's scrubbing on Dr. Brown's breast," may be fine examples of brevity and efficiency in speech, and I have no criticism of

that, but they also illustrate an attitude toward patients that is not particularly healthy. Such conversations indicate a mechanized attitude toward patients who become only cases with organs and blood pressures, and it is forgotten that they are also human beings with emotions that may be more sensitive or more diseased and abnormal than their tissues. The patient's emotional feelings are too often not treated with the same skill and delicacy as his organs. In your profession you have an unusual opportunity to see human beings with the "cellophane" removed. In anesthesia, as in certain other situations of stress, the shell of social amenities fades away, and you have a better chance to see people as they really are emotionally. Sometimes observers are not only surprised but contemptuous of what they see.

A patient with emphysema and a poor vital capacity is considered to have a legitimate problem to be solved with special skill, resourcefulness, and perhaps different technics. After all, he is sick, and he is not blamed. But a patient who is unreasonable or unco-operative is likely to be met with disgust, irritation, and hostility. Instead of saying he has a poor "vital capacity" for anxiety and stress, we label him as a "bad" patient. Instead of being considered emotionally sick or emotionally upset, he is likely to be considered a "louse." To be physically sick or crippled is permissible, but to be emotionally sick, i.e., neurotic, often brings criticism. You can expect, hope for, and sometimes find healthy emotional reactions just as you may find healthy lungs in a patient, but there is no point in being resentful if either of these things in a patient is abnormal.

It is especially important for anesthetists to be constantly aware that a large percentage of patients have some psychologic illness that accounts for much of the so-called "bad" behavior, i.e., resistance and poor co-operation, and that this behavior is motivated not by a conscious and voluntary wish to be difficult, but by unconscious fear and aggressiveness that they are not able to control at the moment. If this is true, it is not only unjustified but unreasonable to become angry, critical, or threatening.

Continued exposure to surgical routine tends to make it seem commonplace, and it is easy to overlook the powerful, distressing impact of the situation on patients. How many times in his office a psychiatrist hears patients undergoing treatment describe, with still fresh anxiety, traumatic experiences that occurred in an operating room. Even though years have passed, they may experience palpitation or nausea or anxiety during the retelling. What makes the experience traumatic to some persons while it is handled with ease by others?

First, a word about what may be called the "normal psychology" of illness. *All* persons who are sick undergo certain psychologic changes. These are lucidly discussed in an article by Dr. John Romano called "Emotional Components of Illness."[5] I highly recommend this article to you who are called upon daily to deal with the sick. I should like to quote briefly from Dr. Romano's article: "Sick people are anxious people. Illness constitutes a definite threat to their security. The resultant anxiety may vary in intensity, expression, and duration dependent upon the interchange of the variables of the character of the noxious stimulus and the nature of the person. Obviously, these varia-

5. Romano, John: Emotional components of illness. Connecticut M. J. 7:22-25, Jan. 1943.

tions may run the full gamut of human experience, from the active defiance and denial of one who cannot tolerate illness to the 'mater dolorosa' attitude of one who finds emotional satisfaction in the passive role of suffering. But throughout the experience of illness one can detect a general principle. One can observe the self-absorption, the retirement from reality and the regression of the sick person."

A fundamental principle in the understanding of sick persons is the concept of regression. They become more self absorbed and less able to consider other persons and to act in a mature and realistic manner. They are not able, and you should not expect them, to be heroic and objective. They become more like children. It is curious how different we feel and behave toward a child than toward a sick anxious adult who emotionally may be very much like a child. The child's anxiety brings forth sympathy and tenderness, while the same reaction in an adult may draw criticism and contempt. The point I wish to make is that psychiatry finds that this regression is a necessary adaptive device and that it should be met with the same understanding, equanimity, and desire to help with which we treat other aspects of illness. In addition to this so-called normal regression that occurs to some degree in all sick persons, other psychologic phenomena are seen in certain neurotic patients and may greatly affect their behavior in regard to anesthesia. One of these phenomena is a "fear of loss of control." As do all neurotic symptoms, this exists to some degree in everyone. It may be considered normal to be afraid of completely abandoning control and of being entirely unable to protect one's self and preserve one's life and safety. Everyone is afraid of being injured, and an operation is injurious despite its good purpose. In some persons, however, this fear of loss of control is tremendously exaggerated. It reaches the point of irrational panic. But again these irrational degrees of fear are due to *unconscious* processes. The patient does not know why he is so afraid.

Sometimes in analytic psychotherapy the basis of these fears can be brought to consciousness. Then, and only then, can the patient gain control by mastering the fears by reason and intelligence. This is the basis of all psychoanalytic therapy. It is usually found that the unconscious conflict has to do with sexual or aggressive feelings or both. The anesthesia-surgery situation may represent to the patient's unconscious fantasy the possibility of a sexual attack under which he will be passive and helpless. This is characteristic of hysterical patients who also frequently have an unconscious fear of being sadistically injured or killed. To certain patients anesthesia represents the potential fulfilment of unconscious fantasies of punishment and death. The idea of being completely out of touch with the world, away from conscious reality, and cut off from contact with all that is familiar, secure, and protecting is nearly unbearable to some persons. This primitive type of anxiety is thought by many psychoanalysts to be a reactivation of infantile anxiety over separation from the mother, who initially represents all that is comforting, safe, and familiar. The degree of anxiety is greatest in those persons whose mother-child relationships were for one reason or another traumatic or unsatisfactory.

Some neurotic persons experience irrational panic even at the idea of going to sleep, that is, of being separated from reality and abandoning

control even to this extent. It would be interesting to find out routinely from patients who are going to undergo general anesthesia whether they have difficulty in going to sleep, how much difficulty, how often, etc., and to see whether there is any correlation between this difficulty and difficulties encountered in the induction of anesthesia.

In contrast, instead of fearing passive suffering, the person may fear that if he loses control he may actively do something or say something aggressive or sexually unacceptable. You have probably had patients who were inordinately curious about how they behaved during anesthesia and who asked, "What did I do," or What did I say?" You may have had patients who did say surprising things, or who masturbated or made sexual or aggressive gestures during induction or recovery from anesthesia. The conscious controlling mind vaguely senses and fears some things in the unconscious. This is true of every individual. It is a biologic fact that we all have certain repressed, controlled, unacceptable fantasies and feelings. But the strength of these feelings, the particular form and content of them, and the degree of control over them vary according to the individual's life experiences, especially very early childhood experiences.

If such fantasies and fears are unconscious and therefore not subject to reason and conscious control, of what practical use is this knowledge to us? Has it any bearing on the practice of anesthesia, or is it just a matter of curiosity? First of all, a rather simple and incontestable point is that it is good to know all you can about human beings. The more you know about man in general, the more skilful and valuable your work with individuals will be. Knowing something about the unconscious mind and how it affects human behavior is at least as important as knowing that there are hormones that affect human metabolism. And beyond this, there are certain practical things you can do, or refrain from doing, in the light of this knowledge.

One practical thing some groups have done is to divert the patient's attention from the anxiety-laden situation by introducing an ancient and powerful sorcerer into the anesthesia and operating room. This is not a witch doctor or a psychiatrist but an instrument, called a magnetic recorder, that plays "silent" music through earphones during the waiting period before anesthesia and, if desired, all through an operation under local or spinal anesthesia. An article in a recent issue of Current Researches in Anesthesia and Analgesia[6] describes this apparatus in detail. The authors meet some of the immediate and obvious objections to such an idea (its cost, clumsiness, danger from sparks, its uselessness, etc., etc.) with some impressive and practical statistics, as impressive and practical as statistics ever are. At any rate, it is interesting and, I think, sound and practical that anesthetists should begin thinking more about, and doing something about, the patient's emotional status during anesthesia.

You cannot banish unconscious fears in the short time before anesthesia, but some things can be done to help the patient control them. This help should be given as early as possible and not in the last thirty seconds before induction. Like a fire, anxiety is easier to prevent than to control once it is in full swing. Too many, or even most, patients

6. Light, G. A.; Haymond, W. V.; Livingstone, H. M., and Willard, J.: Use of magnetic recorder "silent" music during operations. Anesth. & Analg. **28**:330-338, Nov.-Dec. 1949.

come to the operating room with no preparation, other than an injection of morphine, for the trying psychologic experience they are about to undergo. This reflects on surgeons, house staff, and nurses more than on the anesthetists, and the irrefutable answer to this always is, "We haven't the time." I do not debate this, but nevertheless from a psychologic point of view a preliminary visit of ten or fifteen minutes the day before, or a few hours before, would help the anesthetist as well as the patient to create a better psychologic climate for the impending event. If the patient is allowed to talk a little, or even asked to talk or ask questions about his feelings or fears regarding anesthesia, and if he can be given the feeling that you understand and accept him as a person, even if he is neurotic, this will do more to increase his confidence and feeling of security than standard reassurances or a set of orders.

Next, you can realize that the words you say to a patient in preparation for anesthesia are of little or no importance in comparison with the attitude and feeling with which you say them. Cold, logical, reasonable argument has no place in the anesthesia room. For instance, to say to a frightened man, "Now, Mr. Doe, hundreds of people have this done every day, and they get along all right," is small comfort to the anxious Mr. Doe. This is only confronting him with something he already knows, and it may make him even more uneasy to realize that he is making a fuss over something that you consider a mere trifle. For an anesthetist to say to a crying, resisting child, "Why, Johnnie, you're a big boy. I'm surprised at you," is not only useless but a bit dishonest. Furthermore, there is a deprecating, chiding note in both of these comments, and Johnnie or Mr. Doe will sense your disapproval of him. This is where the anesthetist's own reactions affect the situation. If you consider the patient's behavior *bad* and are angry about it, you are very likely to express this feeling unconsciously in what you say to the patient.

I once heard an anesthetist say to a complaining patient, "There is nothing to be afraid of, and if you do just what I tell you, it will be easy." If I had asked her why she said this, I am sure she would have said, "Why to reassure him. To raise his confidence." This would be her rationalization, but from other details, which I will not take time to relate, I know that what she basically was expressing was this: "You are a weakling, and I am angry with you." An allegedly soothing and encouraging remark may hide from the anesthetist her true feelings, but not from the patient. He will sense the underlying disapproval, and it increases his helplessness and fear. If you can understand something of why patients act as they do, it may help you not to get angry or upset about it.

It should be remembered that, by and large, the patients you deal with are anxious, frightened, worried persons who are under realistic stress with respect not only to what the operation means to their life and health, but to what it means to their jobs, their bank accounts, the security of their families, and the plans they may have had to give up or change. It should be remembered that they may also be under unrealistic but nevertheless powerful stress as regards unconscious neurotic fears of anesthesia and surgery. It should be remembered that they are in a new, complex unfamiliar world (the operating room), which is like home to you but to them is strange and even terrifying. In the light of

all this, it is psychologically more sound for you to try to play the role of the calm, patient, and reassuring mother-figure then the role of an impersonal scientific technician who expects good behavior from his experimental animals, or that of the mildly chiding, controlling, so-called "common sense" psychologist who tries to be reassuring by being logical.

An awareness of the feelings of sick people helps the anesthetist to avoid the logical impersonal approach. The good psychologist or psychiatrist will also avoid a mechanistic, stereotyped approach to patients, i.e., the more or less routine preparatory speech filled with traditional routine words of encouragement and suggestion. It is much wiser and more effective to learn something of the individual needs of a patient. A preliminary visit to the patient provides this opportunity, but again this requires time, and in this age of worship of efficiency and mass production, time-consuming procedures are looked on with suspicion and disapproval. It is hard to convince anyone that, of two ways of doing something, the one that requires more time and effort can be better than the one that requires less time and effort. But I maintain that an anesthetist's value and skill are *not* measured by the number of units (or patients) she can process in eight hours. If you undertake to discover and apply psychologic knowledge to the administration of anesthesia, it does not mean you will *lose* time, but that you will be deliberately *using* time in what psychiatry would consider a wise and valuable way.

As an anesthetist you are called upon to tolerate a great deal of anxiety and tension—anxiety and tension not only in your relationship with the patient but often in your relationship with the surgical team whose progress depends upon your skill. You may face unjustified or poorly timed criticism when the anesthesia is not going well. There is then pressure from all sides. You and I, as a psychiatrist, have something in common there. All too frequently in psychotherapy there is criticism from both patients and the physicians who sent them to us and who are anxiously waiting for the treatment to produce results. Incidentally, we also are often harassed by critical relatives. You are at least spared that. An attitude of acceptance and willingness to help is not easy to maintain. It requires a considerable degree of maturity. I read an amusing article by a Dr. R. Warren of Cleveland, called "Beatitudes for the Anesthesiologist."[7] "Blessed are ye when men shall revile you and persecute you and shall say all manner of evil against you falsely and ye shall remain still. Rejoice and be exceedingly calm, for so persecuted they the anesthetists who were before you."

Even though you do not have the time to solve by psychotherapy the conflicts of the patients (or the physicians) that cause trouble in anesthesia, it is possible (and it is the best you can do) to understand something about these conflicts and to conduct yourselves in the light of what you know. Then, even if the patient does not change, you, the anesthetist, may be able to affect the situation by clear thinking and reasonable behavior. In many cases you can affect the situation favorably.

---

7. Warren R.: Beatitudes for the Anesthesiologist. Anesth. & Analg. Sept.-Oct. 1949.

NOTES

CASE REPORTS *are the foundation of the medical literature. Their brevity makes them interesting to write and assures their being read. There is a place in this section of* NOTES *for case reports as well as for descriptions of gadgets and special technics. Send in your contribution now. Other anesthetists will be helped by it.*

PENTOTHAL SODIUM, *d*-TUBOCURARINE, AND NITROUS OXIDE-OXYGEN IN A 50-50 PER CENT MIXTURE.—The combination of pentothal sodium, *d*-tubocurarine, and nitrous oxide-oxygen in a 50-50 per cent mixture provides an almost ideal type of balanced anesthesia. Induction is pleasant, a light, easily controlled plane of anesthesia can be maintained, and the patient awakens as pleasantly and comfortably as he goes to sleep, with a minimum of after effects. The surgeon, furthermore, appreciates the fast induction, the relaxation comparable to that of spinal anesthesia, and the early recovery of the patient.

Contraindications to the use of the combination are those to the use of pentothal sodium and *d*-tubocurarine. In the absence of contraindications and individual reactions, the combination may be used in some cases for which formerly curare and pentothal sodium have not been advocated. Only small amounts of pentothal sodium are needed; laryngeal reflexes are abolished by the *d*-tubocurarine; and oxygenation is maintained at a maximal level with the use of 50 per cent oxygen in the gaseous mixture. The nitrous oxide also seems to act synergistically with the pentothal sodium, and this reduces the amount of the latter drug needed.

The equipment consists of the Abbott single unit, disposable tubing for the administration of pentothal sodium, a 50 cc. syringe, a stock bottle of 2 per cent solution of pentothal sodium, Squibb *d*-tubocurarine, and a 5 cc. syringe. When the administration of fluids intravenously is required, a three-way stopcock is placed on the disposable tubing, and the intravenous tubing and the 50 cc. syringe are connected directly to it to decrease the possibility of contamination.

After venipuncture 10 to 12 cc. of the 2 per cent pentothal sodium solution is given slowly until the patient stops talking voluntarily, closes his eyes, and has regular even respirations. (To reach this stage, the patient may require as much as 20 cc. of the 2 per cent solution or as little as 8 cc.) *d*-Tubocurarine, 2 cc. (6 mg.), is then given, and the face mask adjusted for the administration of 50 per cent oxygen and 50 per cent nitrous oxide. While the patient is being prepared for the operation, an additional 2.5 to 5 cc. of the 2 per cent pentothal sodium solution is given slowly, and during the arrangement of the drapes, another 1 cc. (3 mg.) of *d*-tubocurar-

ine. By this time about five minutes has elapsed, and the patient is ready for the operation.

Subsequent doses of pentothal sodium and *d*-tubocurarine depend on the age and physical condition of the patient, the type of operation, and the wishes of the surgeon. Usually, 0.5 cc. (1.5 mg.) *d*-tubocurarine is given first at five minute intervals, after the initial doses totalling 3 cc., and then at longer intervals until the peritoneum is closed.

As soon as the anesthesia is stabilized, divided doses of 2.5 to 5 cc. of the 2 per cent pentothal sodium solution are given first at five minute intervals and then at longer intervals until the peritoneum is closed.

Rarely, for the average operation lasting one to one and one-half hours, does the dosage of *d*-tubocurarine exceed 7 cc. or the dosage of pentothal sodium exceed 65 cc. of the 2 per cent solution. For simple appendectomy or herniorrhaphy the dosage of *d*-tubocurarine is about 4 cc. and of pentothal sodium 35 to 40 cc. of the 2 per cent solution.

If there is a tendency for the anesthesia to lighten and for the blood pressure, pulse rate, and respiratory rate to increase, the administration of more pentothal sodium will bring the condition under control.

Seldom is intubation performed when this combination of agents is used. An airway is usually assured with the use of a nasopharyngeal tube or the Leech airway.—G. Dan Kelly, R. N., and P. J. Tripp, R.N., Midland Hospital, Midland, Mich.

LEGISLATION

Emanuel L. Hayt, LL.B.*

The Facts Claimed Must Be Proved at the Trial.—An appeal was taken by a hospital from a judgment against it, based upon the death of a 3-year-old child in the course of a tonsillectomy performed in the hospital.

It was claimed by the parents that the infant child suffered a severe hemorrhage during the operation and that hemorrhagic material was allowed to flow unchecked into the child's lungs, causing the child to suffocate and die upon the operating table.

At the trial, however, the proof was that the child died from blood collecting in its lungs and from an overdose of ether.

The change of the parent's theory, argued the hospital, was prejudicial, because the anesthetist whose negligence was claimed to have resulted in the lethal dose was not available at the trial. Had the hospital known that the story would be changed at the trial, it would have at least attempted to get the anesthetist to testify. This variance between the allegations before the trial and the evidence at the trial was so material, the court held, as to amount to a failure to prove the allegations of the complaint. The judgment against the hospital was therefore reversed.

*Counsel for A.A.N.A.

Cavero v. Franklin Hospital, 214 P. 2d 854 (Calif. App.)

THE NEWS

ACCREDITING ADVISOR TO BE NAMED

Committee Appointments for 1950-51

Plans and projects authorized by the membership and the Board of Trustees at the Seventeenth Annual Meeting are getting underway. The Advisory to the Approval Committee is investigating persons to fill the position of accrediting advisor, the appointment to be made in the near future by the Board of Trustees. The plan for the accreditation of schools of anesthesia for nurses, as unanimously approved by the voting members at the annual meeting, also calls for workshops for the formulation of criteria for accreditation.

Of the increase in dues from $12 to $20 for active members, $5 is to be allocated to the accreditation program. Each active member has been sent a letter explaining the increase and setting forth the procedure for remittance. After March 1 all members who have not remitted dues will be removed from the mailing list and will not receive association publications.

Projects of the Public Relations Committee include the preparation for state public relations committees of copies of the resolution supporting the Bolton bill. The bill provides for equal status for male nurses in the Armed Forces. The committee will also prepare fact sheets for anesthetists who address groups of student nurses on anesthesia as a career and for members

Officers and trustees of the A.A.N.A. for 1950-51: (left to right standing) Betty E. Lank, Edna Peterson, Mary Costello, Lillian Baird, trustees; (seated) Josephine Bunch, 1st vice president; Verna Bean, president; Minnie V. Haas, 2nd vice president. (Not pictured: Agnes Lange, treasurer; Harriet Aberg and Hazel Peterson, trustees.)

Myra Van Arsdale presenting the 1950 Award of Appreciation to Gertrude L. Fife at the annual banquet on September 20.

who participate in discussions of hospital anesthesia service.

The Publications Committee will undertake the establishment of a lending service for books on anesthesia with the co-operation of the A.H.A. library.

The Board of Trustees has authorized the Examination Committee to employ the services of testing experts to aid in the construction of test items for the qualifying examination. The Otis Testing Service of Western Reserve University, Cleveland, is the agency to be employed.

A motion to investigate the establishment of a prize for a student thesis has been referred to the Educational Fund Committee.

The Government Relations Committee is to investigate legislation providing federal aid for the education of nurses to ascertain whether it includes provision for advanced preparation in anesthesia.

Birmingham, Ala., has been selected as the site of the 1951 Institute to be held in February under the joint auspices of the A.H.A. and the A.A.N.A.

A.A.N.A. COMMITTEES FOR 1950 - 51

Appointments to A.A.N.A. committees were made at the postconvention meeting of the Board of Trustees in Atlantic City, September 22, 1950. The members of standing committees are appointed for one year and are eligible for reappointment, unless otherwise specified in the *Bylaws*. The committee members whose names are published here have accepted the appointments.

Speakers and representatives of the state associations at the annual banquet on September 20.

Advisory to Approval
Helen Lamb, chairman
Lillian Baird
Mary O'Carroll
Miriam G. Shupp

Approval
Margaret Sullivan, chairman
Dorothy Finley
Minnie Haas
Sister Seraphia

Approval of Minutes
Pauline Henry, chairman

Convention Arrangements
Dean Eberhardt, chairman
Helen Lamb
Norma Coggan

Credentials
Lucy Richards, chairman

Curriculum
Helen Vos, chairman
Evelyn Auld

Education
Mildred Schulz, chairman
Alberta Boggan
Marie Callori
George Cothren
Ann Decker
Helen Vos
Janet McMahon, ex officio

Educational Exhibits
George Cothren, chairman
Ann Butterworth
Inez Varner

Educational Fund
Mary Costello, chairman
Ernestine Fish
Ellen McMahon

Examination
Janet McMahon, chairman
Evelyn Auld
Martha Lundgaard
Margherita Powers
Ruth Satterfield
Sister Rudolpha

Finance
Exire O'Day, chairman
Rosella Crotty
Agnes Lange

Government Relations
Betty Lank, chairman
Cleo Bopp
Ruth Cook

Institutes
Alberta Boggan, chairman

Nominating
Anne Beddow, chairman
Marie Hebert
Louise Ilgenfritz
Martha Jackson
Madeleine King

Planning
Edna Peterson, chairman
Verna Bean
Laura Hoffman
Agnes Lange

Program
Dorothy Schmidt, chairman
Ada Willmore
Wilma Zumwalt
Mildred Hodges
Marie Brown

Public Relations
Myra Van Arsdale, chairman
Marie Kraft
Arlene Sandwick
Maudie Yonce

Publications
Opal Schram, chairman
Harriet Aberg
Leona Bridenhagen
Frances Fanning

Resolutions
Eileen Landis

Revisions
Hazel Peterson, chairman
Palma Anderson
Pauline Henry

SPECIAL COMMITTEES

University Program for Hospital Administrators
Sister Reginella, chairman
Opal Schram
Phyllis Roberts

History
Gertrude Fife, chairman
Virginia Thatcher, ex officio
Florence McQuillen

Personnel Practices
Josephine Bunch, chairman
Minnie Haas

Involuntary Recall of Army Nurse Reserves

The Department of the Army has announced that 650 Army Nurse Corps Reserve officers in the grades of lieutenant and captain will be ordered to active duty with or without their consent in periodic increments between September 25 and November 29. Officers will be recalled in Reserve grades presently held. The program of involuntary recall is being instituted to overcome the critical shortage of nurses now existing in military medical facilities.

To keep to a minimum consistent with national security the number of nurses ordered to active duty at this time, quotas have been allocated each of the six Army Areas based on requirements by grade in the various nursing specialties. The quota calls for 66 nurse anesthetists.

Part of the audience to the skit, "The Frame," after the annual banquet on September 20.

SCENES FROM "THE FRAME"

ABSTRACTS

DILLON, J. B., AND DENSON, J. S.: Clinical trial of surital sodium, a new intravenous barbiturate. Report of seven hundred cases. Ann. West. Med. & Surg. **4**:172-173, Apr. 1950.

"From time to time a new, ultrashort acting barbiturate has been prepared for intravenous use in the production of surgical anesthesia. One of the more recent of these is Surital Sodium. . . . Surital Sodium was substituted for Pentothal Sodium as the intravenous barbiturate to be used in the production of anesthesia at the Los Angeles County Hospital. . . . The drug was used over a three-month period in a total of 700 patients varying in age from 2 months to 94 years. All types of cases were included. . . . The effect of this drug in the production of surgical anesthesia was found to be similar to that of Pentothal Sodium."

ABERNETHY, A. C.; WILETS, A. J., AND BEER, D. C.: Lower nephron nephrosis. Report of two cases treated with intravenous procaine. U. S. Armed Forces M. J. **1**:296-308, Mar. 1950.

"Lower nephron nephrosis occurs after such conditions as crushing injury, sulfonamide intoxication, blood transfusion reaction, intravascular hemolysis, and following transurethral prostatic resection. There are a number of concepts regarding the mechanism of anuria in lower nephron nephrosis. The work of Trueta and others indicates that the underlying factor is a renal cortical ischemia which occurs because of stimulation of the renal vasomotor nerves and diversion of the renal blood flow from the cortex to the medulla. The cortex becomes ischemic and thus occurs the renal cortical injury seen in the crush syndrome and allied states. It has been suggested that this mechanism may be prevented by blocking the renal vasomotor pathways, e.g., caudal high spinal anesthesia or splanchnic block. . . .

"In the [two patients treated with procaine hydrochloride] no increase in diuresis followed the intravenous injection of procaine hydrochloride. Nevertheless, this still may be a step in the right direction to combat the deleterious effect of the medullary bypass on the function of the kidney. It may be that, in order to effectively accomplish this, the amount of procaine administered will have to be increased. Perhaps, nerve block or decapsulation with denervation will prove to be the most effective single procedure (other than dietary and fluid restriction) in the treatment of lower nephron nephrosis."

KURFEES, J. G.; WHITEHOUSE, SCOTT, AND CERZOSINO, FRANK: Anesthesia for the paraplegic patient. J. A. M. A. **141**: 638-640, Nov. 1949.

"Since January 1945 we have had the opportunity to observe a series of 49 cases in which injuries of the spinal cord resulted in either complete or partial paralysis of the lower extremities with varying degrees of dysfunction of bladder and bowel. The cervical region was involved in 14 cases, the thoracic in 30 and the lumbar in 5. The total number of surgical operations performed in these 49 cases was one hundred and sixty-seven . . . . Of these operations, twenty-five did not require anesthesia of the patient because the operative site was well below the level of the lesion . . . .

"Many paraplegic persons are in a state of malnutrition with low hemoglobin and plasma protein levels. Patients with plasma proteins below 6 to 8 Gm. per hundred

The Doctors Salute the Nurses of America:

FREEDOM IS On the March!

America is proud of its freedom! It is justly proud of the free enterprise that has made it the strongest, the healthiest of all great Nations. And the Nurses of America can well be proud of the vital role they have played in making our country's health care structure **the finest on earth.**

In much of the world today, freedom is on the defensive. In America it is on the march! In countries where the people have resigned from the responsibilities of managing their own lives, the reward has been the false, tragic "security" of regimentation, of slavery. In America the people have emphatically reaffirmed their belief in human dignity, human freedom.

A MANIFESTO OF FREEDOM

Side by side with the medical profession, Americans by the millions, through 10,000 responsible public organizations—farm, business, religious, women's, hospital and civic groups—have registered strong opposition to Compulsory Health Insurance.

In one of the greatest economic movements in history more than 70 million Americans, on their own initiative, have sought the protection of Voluntary Health Insurance—the budget-basis protection against the major costs of illness.

Both medical and commercial sponsors are working constantly to improve and extend the Voluntary prepay plans—and to include additional services and facilities.

The Nurses of America are a living symbol of service to humanity. Together, all of us—nurses, doctors, teachers, technicians, laymen—will maintain the freedom of the medical profession, of all professions, in the sincere conviction that—

NATIONAL EDUCATION CAMPAIGN
AMERICAN MEDICAL ASSOCIATION

cubic centimeters or hemoglobin below 80 per cent had transfusions of whole blood. Unless positive nitrogen balance is maintained, wound healing is retarded and resistance to infection is decreased. . . . After the occurrence of an injury to the spinal cord there is an immediate change in the state of a person from independence to almost complete dependence on others for transportation, nourishment and disposal of excreta. Depression even with thought of suicide is not uncommon. Because of his physical dependence on others, the paraplegic person becomes less mature emotionally as shown by irritability, fits of anger and depression. Since these patients show pronounced emotional instability, it is of the utmost importance that the anesthetist gain their confidence. This is accomplished during preoperative rounds, when the purpose and methods of the anesthesia are discussed with the patient and an attempt is made to evaluate his emotional status. The paraplegic patient in our experience has a low threshold for pain, and, because many of them have received analgesics for considerable periods of time, larger doses of depressant drugs are required for premedication. . . . In our series of cases we have given the patients ether and thiopental sodium in varied technics. . . . Endotracheal administration was the method used, whenever indicated (as in the sitting, prone or lateral position), to insure a patent airway. Several of the patients were in cervical traction, and in these intubation was done with topical cocainization before general anesthesia was induced. It is our belief that in qualified hands any agent can be administered to paraplegic persons with any suitable technic if such fundamental physiologic and pharmacologic principles as adequate fluid therapy, oxygenation and maintenance of blood pressure are observed. . . .

"The problem of adequate respiratory exchange and the position required during surgical intervention concerns the anesthesiologist more in the paraplegic patient than in many other types of patients. In injuries of the thoracic and cervical parts of the spine, paralysis of the intercostal muscles places the full burden of respiratory exchange on the diaphragm. Often hemopneumothorax is a complication of thoracic spine and rib injuries, and its displacement of available pulmonary area also reduces respiratory exchange. Changes in position in such cases may cause mediastinal shifts with all the attendant reflex physiologic emergencies. Increase in abdominal pressure in the paraplegic patient can encroach on what little efficiency there remains in diaphragmatic breathing and thereby increase any degree of anoxia that may already exist. With this problem in mind one must protect the respiratory efforts that are present and assist them as needed. In prone positions the patient is supported by rolled sheets extending bilaterally from the clavicle to the anterosuperior part of the spine. This permits minimal interference with respiratory exchange. In sitting positions for cervical laminectomies, careful positioning is important to obviate any interference with diaphragmatic activity. Well padded arm supports are used to maintain this position and to prevent any weight bearing by muscles of the shoulder girdle. The presence in the paraplegic patient of an abnormal cutaneous vascular reflex renders the skin over weight-bearing bony points, especially over the sacrum, ischia and trochanters, particularly susceptible to pressure ischemia and

SODASORB

the largest selling brand of

CO_2 ABSORBENT

for medical use

Hospitals buy more **SODASORB**, the genuine Wilson Soda Lime, than any other brand on the market. Doctors everywhere insist on **SODASORB** because of its **accepted** efficiency in oxygen therapy, anesthesia, and metabolators . . . because of its **proven** dependability, economy, and comfort for the patient. This universal acceptance of **SODASORB** is based on actual performance . . . the high absorbent power that is a direct result of **SODASORB's** distinctive physical form as well as its 3-way chemical reaction.

SODASORB is available

in 2 types:
Regular and Indicator,
in 3 standard mesh sizes:
Coarse, Medium and Fine,
in High and Low moisture grades . . . packed in
5 gallon Pails,
1 gallon Cans,
1 lb. Glass Jars

SODASORB, WILSON T.M. REG. U.S. PAT. OFF.

DEWEY AND ALMY CHEMICAL COMPANY

Cambridge 40, Massachusetts • Montreal 32

necrosis. Experience has shown that continued weight bearing cannot be extended beyond two hours at a time without risk of producing pressure necrosis, which inevitably leads to ulcers with all the attendant difficulties of hypoproteinemia, infection, toxicity and anemia. Special attention must be given by the anesthetist to the paraplegic patient to insure careful padding and positioning of the weight-bearing bony points.

"Because of the high incidence of renal calculi, fluid replacement during surgical procedures should be adequate to maintain renal function and prevent stasis. The position of paraplegic persons who have indwelling catheters connected to rubber bladder bags strapped to an extremity must be arranged so that no pressure or weight will be applied to that bag, since bag pressure will distend the patient's bladder, resulting in postoperative discomfort for several hours. . . . In regard to blood pressure, pulse and respiratory patterns of paraplegic patients, our series did not reveal any unusual features. . . . The paraplegic patient with cervical or thoracic involvement has an impairment of respiratory exchange and an inability to cough forcibly. With this in mind it must be made certain postoperatively that careful and thorough tracheobronchial aspiration is performed and adequate pulmonary exchange is present in both lung fields. Ward personnel who are well trained in postoperative care pertaining to preservation of the airway, adequate aspirations, adjustment of position and recognition of impending shock during the recovery period must be available. . . . Other than 1 case of atelectasis in which the patient made an uneventful recovery, there were no anesthetic complications. . . . There was 1 case of meningismus subsequent to a thoracic laminectomy. During a nephrolithotomy the diaphragm was inadvertently injured, resulting in pneumothorax. In 1 patient there developed postoperative surgical shock. . . .

"It is concluded from our clinical observations that paraplegic patients present no insurmountable problems in anesthesia, provided the usual basic fundamental principles of anesthesia are observed, namely, adequate oxygenation, sufficient fluid replacement therapy and maintenance of circulation."

FLUIDS

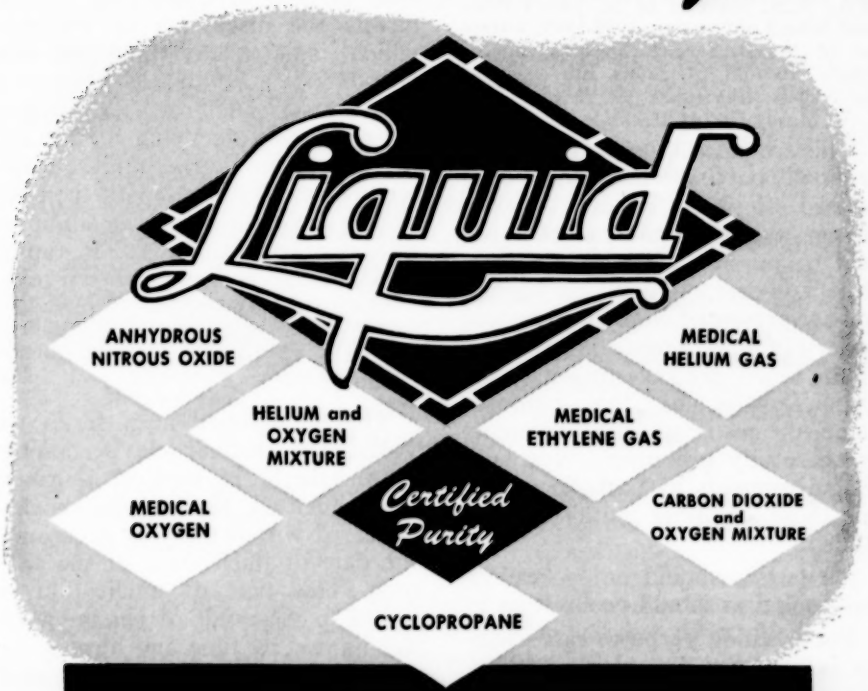
(Continued from page 243)

sufficient for several days. Thereafter the patient ordinarily takes a well balanced diet, and vitamins are unnecessary. The administration of vitamins has value when the patient is malnourished or when food will be withheld for many days.

Vitamin A is important in epithelial regeneration. Vitamin B is associated with cellular respiration, carbohydrate metabolism, and cellular oxydation. Vitamin C plays a fundamental role in the healing of wounds and in the resistance to and the localization of infection. Vitamin C is given in either 100 mg. or 200 mg. doses three times a day. Vitamin D is important in the absorption of calcium and phosphorus and therefore is of value in the healing of fractures, blood clotting, and in the maintenance of normal capillary permeability. Its value in parathyroid tetany is well known. The administration of vitamin K is necessary in all cases of obstructive jaundice, where absorption of vitamin K is poor or absent.

TO BE SURE!–

Specify RED DIAMOND *Medical Gases*



ANESTHETIC • THERAPEUTIC • RESUSCITATING

All "RED DIAMOND" Medical Gases conform to the highest medical and dental standards for certified purity and absolute dependability. Each is as uniform from cylinder to cylinder as the labels that identify them. *For complete satisfaction, order Red Diamond Gases.*

Distributed nationally through a network of conveniently-located producing plants, distributing points and authorized dealers.

THE LIQUID CARBONIC CORPORATION
Medical Gas Division
3110 South Kedzie Avenue • Chicago 23, Illinois
Branches and Dealers in Principal Cities
IN CANADA: WALL CHEMICALS CANADIAN CORPORATION • Montreal • Toronto • Windsor

BOOK REVIEWS

Professional Adjustments. By Sister Mary Isidore Lennon, R.S.M., R.N., B.S., M.A., M.S., Director of St. John's Hospital School of Nursing, 1939-1945; Director of Social Service Department, St. John's Hospital, St. Louis. Ed. 2. Cloth. 362 pages. Illustrated. St. Louis: The C. V. Mosby Co., 1950.

This second edition of a textbook originally published in 1946 has been revised to keep abreast of the changes that have taken place in the field of nursing. The basic principles, however, remain unchanged and are presented with sincerity and understanding. From the problems of the newly arrived student to the responsibilities of the graduate nurse, the professional adjustments are carefully presented. Not only the adjustments of Catholic nurses but those of other faiths are included.

All nurses should enjoy reading this book and should profit from it.

For teaching purposes each chapter is followed by pertinent references, a vocabulary, an outline summary, review questions, and suggestions for projects.

A bibliography of suggested readings for nurses, a glossary, and an index complete the volume.

The Physiological Basis for Oxygen Therapy. By Julius H. Comroe, Jr., M.D., Professor of Physiology and Pharmacology, Graduate School of Medicine, University of Pennsylvania; Clinical Physiologist, Hospital of the University of Pennsylvania, and Robert D. Dripps, M.D., Professor of Anesthesiology, University of Pennsylvania School of Medicine; Director of Anesthesiology, Hospital of the University of Pennsylvania. Cloth. 85 pages. Springfield, Ill.: Charles C Thomas, Publisher, 1950. $2.00.

This is one of a series of monographs in the American Lecture Series. The first chapter is a presentation of the effects of the inhalation of oxygen by normal man. The second chapter presents the subject of anoxia in much detail. The authors have used their classification for causes of anoxia based on etiology. This method of classifying anoxia affects the discussion of therapy, which is also presented in this chapter.

In a brief chapter uses of oxygen for conditions other than anoxia are discussed. The fourth and last chapter presents at some length the possibilities of harm from the administration of oxygen. A bibliography of 100 references follows the text.

Anesthesia Abstracts. By John S. Lundy, M.D., and Florence A. McQuillen, R.N. Vol. 29. Paper. 215 pages. Minneapolis: Burgess Publishing Co., 1950. $3.00.

This is another in a series of volumes in which articles pertaining to anesthesia in medical journals are condensed. Most of the articles appeared within the year preceding the date of publication of the volume. This type of publication is suited to the needs of persons who are limited by time and library facilities and who wish to keep abreast of current trends in the anesthesia literature. The volume contains 250 abstracts from sixty-four medical journals. Indexed.

History and Trends of Professional Nursing. By Deborah MacClurg Jensen, R.N., B.S., M.A. Assistant Director, School of Nursing, St. Louis City Hospital; Instructor in Nursing Education and Sociology, University of Missouri. Ed. 2. Cloth. 365 pages. Illustrated. St. Louis: C. V. Mosby Co., 1950. $3.25.

The first edition of this book was entitled *History of Nursing*. It has been revised to emphasize the trends that have influenced nursing as a profession rather than to cover the whole field of nursing. To this end,

Ready in December . . .

Anesthesia Abstracts, Vol. XXX

by

John S. Lundy, M. D. and Florence A. McQuillen, R. N.

Dr. John S. Lundy, Co-editor

The latest edition of this popular series, Volume 30, will be ready for distribution late in December. It is priced at $3.25 per copy and will include a cumulative index of Volumes 21 through 30.

• Semi-annually since 1937, the better articles on anesthesia have been abstracted and published under the auspices of the Journal Club of the Mayo Clinic. Volume 30 and subsequent editions will be published under the joint editorship of Dr. Lundy and Miss McQuillen.

• Copies of some of the earlier volumes are still available. However, the supply is limited and no reprints of this series are contemplated.

• Anesthetists who wish to order the new Volume 30 or back Volumes . . . or who would like to become regular subscribers to all future editions, may conveniently do so by using the coupon listed below. Regular subscribers automatically receive and are billed for two new books each year. No advance payment is required for this service.

ORDER HERE

BURGESS PUBLISHING COMPANY
426 South Sixth Street
Minneapolis 15, Minn.

Please send me the following editions of ANESTHESIA ABSTRACTS:

☐ Vol. 30—$3.25	☐ Vol. 26—$3.00	☐ Vol. 20—$3.25	☐ Vol. 16—$2.75
☐ Vol. 29—$3.00	☐ Vol. 25—$3.00	☐ Vol. 19—$2.75	☐ Vol. 3—$2.00
☐ Vol. 28—$3.00	☐ Vol. 22—$2.75	☐ Vol. 18—$2.75	☐ Vol. 2—$2.00
☐ Vol. 27—$3.00	☐ Vol. 21—$2.75	☐ Vol. 17—$2.75	☐ Regular Subscriber

Name _____ ☐ Payment enclosed*
Address _____ ☐ Bill me
City _____ Zone _____ State _____ ☐ Send C.O.D.

*We Pay Cost Of Mailing On All Prepaid Orders

the events preceding the "Nightingale period" are depicted in considerable detail. Social, economic, and political backgrounds as well as medical developments are integrated. Various units are followed by series of study questions and references. Footnote references are made to data referred to in the text. Indexed.

ANESTHESIA FOR THE PSYCHOTIC PATIENT

(Continued from page 260)

Summary

The administration of anesthesia for institutionalized patients with psychoses is attended by a variety of problems that are not encountered in a general hospital. Brain damage is frequently present, and cyanosis must not be allowed to develop. The patients are often poor operative risks because of the late recognition of the condition requiring operation, the difficulty of making a diagnosis, the patient's debility and lack of desire to live, and poor personal hygiene, especially of the mouth.

Pentothal sodium and curare are particularly valuable anesthetic agents in a mental hospital. Pentothal sodium is frequently used for anesthesia for short operative procedures and examinations and for induction for dental extractions. With the use of curare there is assurance that the patient will be awake when he is returned to the ward.

The effect of kindness and the proper psychologic approach on the institutionalized patient having to undergo an operation is dramatic. The anesthetist or the nurse must be sympathetic, kind, and patient. The need for increased numbers of competent personnel in the mental hospital is very great. The work is interesting, challenging, and offers immeasurable satisfaction in achievement.

OPINION REVIEW

(Continued from page 226)

much of the second stage and the most satisfactory delivery. Much of our success is due to our trained, clever, nurse anesthetists who not only watch the patients during analgesia, but who during the second stage give inhalation anesthesia at first intermittently with pains, with a gradual increase to complete surgical anesthesia for deliveries.

Control of pain in childbirth without ill effects on the baby is a challenge that today faces every anesthetist who attends a mother's delivery. Of course, the danger to the child is acute when these brain-drugging agents are used in dosage sufficient to relieve the mother of her suffering. Yet, the nurse anesthetist is expected not only to relieve pain but completely to control the anesthetic agent throughout the procedure. Those entrusted with the safety of delivery of the baby must accept the challenge and protect him from hypoxia. She also is able to cope with complicated deliveries such as podalic version and breech presentation where the plane of anesthesia has to be deepened. She will know the condition of the patient every second of the time remembering, "Eternal vigilance is the price of safety," and realizing that it involves two lives, that of mother and infant.

The obstetrician of today is well aware of the importance of a well trained anesthetist. In turn the anesthetist has recognized the challenge of obstetric anesthesia. — Sister Rudolpha, R.N., Springfield, Ill.

CLASSIFIED ADVERTISEMENTS

NURSE ANESTHETIST: A.A.N.A. member. Small new hospital. To act as second anesthetist. Excellent working conditions. Full maintenance. State salary expected and full qualifications. Apply: Box A-20, Journal A.A.N.A., 22 E. Division St., Chicago 10, Ill.

ANESTHETIST: For 130 bed hospital near St. Louis. Salary $300 to $350 and full maintenance, based on experience. Apply: Administrator, Alton Memorial Hospital, Alton, Ill.

WANTED: Two nurse anesthetists. Four weeks' vacation with pay. Fourteen days' sick leave. Six holidays. Excellent salary and maintenance. Apply: Administrator, The Williamsport Hospital, Williamsport, Pa.

NURSE ANESTHETIST: A.A.N.A. member. 200 bed general hospital. To increase department now consisting of one anesthesiologist, three nurse anesthetists. Salary dependent on qualifications. Write: Administrator, Samaritan Hospital, Troy, N. Y.

OPENING FOR NURSE ANESTHETIST: 250 bed hospital. No obstetrics. Department headed by medical anesthesiologist. Starting salary $230. Please give full information in first letter, stating whether possible to appear for interview. Peter Bent Brigham Hospital, 721 Huntington Ave., Boston 15, Mass.

NURSE ANESTHETIST wanted for night duty; 35 to 50 years of age. Five day week; not many night calls. On duty every fourth weekend. Five in department, including one M.D. 200 bed general hospital close to Chicago. Apply: Box M-10, Journal A.A.N.A., 22 E. Division St., Chicago 10, Ill.

WANTED: Nurse anesthetist for tuberculosis sanatorium, Seward, Alaska. Salary open, depending upon experience. Forty hour week; two weeks' vacation and two weeks' sick leave. Transportation between Seward and Seattle paid after one year. Write: Administrator, Seward Sanatorium, Seward, Alaska. State training and experience.

NURSE ANESTHETISTS: 175 bed hospital, general, near Chicago. Salary $325-$375 with maintenance. Apply: Box F-10, Journal A.A.N.A., 22 E. Division St., Chicago 10, Ill.

NURSE ANESTHETIST: 115 bed general hospital in metropolitan area, Washington, D. C. Salary $325 per month with complete maintenance. Three other anesthetists in department with full-time M.D. Vacation and sick leave policy. Apply: Administrator, Arlington Hospital, Arlington, Va.

NURSE ANESTHETIST to rotate with four others. General hospital; average census 160. $340 plus laundry of uniforms; room if desired. Baptist Hospital, Alexandria, La.

WANTED NURSE ANESTHETIST: 187 bed general hospital. 15 miles north of Pittsburgh, Pa. Salary $275-$300 plus meals and laundry. Fifty hour week policy; twenty-eight day vacation, ten day sick leave, five holidays, or equivalent. Apply: Superintendent, Sewickley Valley Hospital, Sewickley, Pa.

WANTED: Nurse anesthetists. Several immediate vacancies. Salary $250-$350 monthly. Full maintenance optional. Vacation, sick leave, hospitalization, etc., allowed. 375 bed general hospital. Apply: W. S. Kohlhaas, Superintendent, Harrisburg Hospital, Harrisburg, Pa.

WANTED: Nurse anesthetist, A.A.N.A. member, for oral surgeon's office. Forty hour week. Salary $300 a month. Dr. Robert Rankin, Medical Arts Building, Asbury Park, N. J.

NURSE ANESTHETISTS for 318 bed municipal hospital. Forty hours living out jobs. Liberal sick time and vacation allowances. Salary: $2,750 per annum. Write: Medical Superintendent, Cumberland Hospital, 39 Auburn Pl., Brooklyn 1, N. Y.

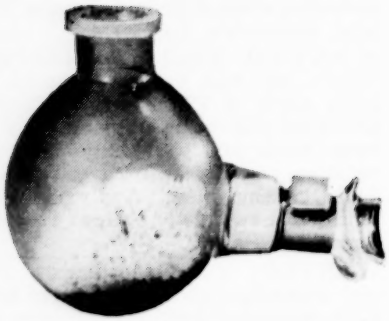
ANESTHETIST-NURSE: 200 bed general hospital. No night call. Salary open. Five nurse anesthetists employed. Nurse anesthetist in charge. Mrs. Catherine Little, Fairview Park Hospital, Cleveland 13, Ohio.

ANESTHETISTS seeking full-time or part-time employment, contact the Washington State Nurse Anesthetist Placement Bureau, located at Swedish Hospital, Anesthesia Department, Seattle, Wash.

NURSE ANESTHETIST for 50 bed modern hospital. Salary open; state experience. Apply: Sister Administrator, Our Lady of Lourdes Hospital, Lafayette, La.

NURSE ANESTHETISTS: Positions open in many hospitals throughout the South. Salary range, $250 to $350 per month with full maintenance. Medical Placement and Mailing Service, 768 Juniper St., N.E., Atlanta, Ga.

WANTED IMMEDIATELY: NURSE ANESTHETISTS for 700 bed general hospital. Pleasant working conditions. Salary open. Complete maintenance. Liberal employee benefits. Apply: Personnel Director, Grady Memorial Hospital, 36 Butler St., S.E., Atlanta, Ga.

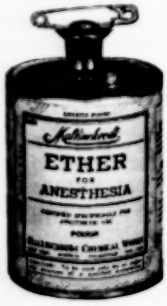


fortunately ether came first

It is most fortunate that Ether was the first anesthetic agent discovered . . . a wide margin of safety . . . powerful and easy to give . . . plays an important role in surgery of the spleen in both adults and children . . . serves well for tonsillectomies and adenoidectomies and for other surgical procedures on children.*

So mounts the evidence in favor of Ether, now entering its second century as the world's first—and still basic—anesthetic. In the majority of surgical procedures anesthesiologists depend upon Ether to give even the deepest anesthesia with comparative safety.

High standards of manufacture developed during eight decades of precision production enable Mallinckrodt to offer Ether for Anesthesia of unsurpassed uniformity in potency, purity and stability.



☆

Mallinckrodt Ether for Anesthesia is supplied in ¼-lb., ½-lb., 1-lb. and 5-lb. cans.

*Habeeb, A., and Elliott, H. R.: Choice of Anesthetic, J. M. A. Alabama, 15: 177-80 (Dec. 1945.)

Mallinckrodt's sound motion pictures, "ADVENT OF ANESTHESIA" and "ETHER FOR ANESTHESIA" are available to medical societies and other professional groups. Write to our St. Louis or New York office for details.

83 Years of Service to Chemical Users

MALLINCKRODT CHEMICAL WORKS

MALLINCKRODT STREET, ST. LOUIS 7, MO. • 72 GOLD STREET, NEW YORK 8, N. Y.
CHICAGO • CINCINNATI • CLEVELAND • LOS ANGELES • MONTREAL • PHILADELPHIA • SAN FRANCISCO
UNIFORM DEPENDABLE PURITY

INDEX TO ADVERTISERS

American Medical Association 287
Bilhuber-Knoll Corp. 297
Burgess Publishing Co. 293
Dewey and Almy Chemical Co. 289
Edison 228
E & J Manufacturing Co. 223
Liquid Carbonic Corporation 291
Mallinckrodt Chemical Works 296
Merck and Company, Inc. 222
McKesson Appliance Company 225, 227
Ohio Chemical and Mfg. Company ..... BC
Puritan Compressed Gas Corp. ..... IFC
Linde Air Products Co., Union Carbide and Carbon Corp. ..... IBC
E. R. Squibb & Sons 221
Classified Advertisements 295

Oenethyl hydrochloride

For intravenous injection, 50 mg. in divided doses, during spinal anesthesia to raise a depressed blood pressure . . . for prophylaxis, 50 to 100 mg. intramuscularly.

Ampules 1 cc. (50 mg.), boxes of 6 and 100 ampules
2 cc. (100 mg.), boxes of 5 and 50 ampules
Vials 10 cc. 5% Sterile Solution (50 mg. per cc.)

Oenethyl (methylaminoheptane) Trade Mark Bilhuber.

Literature available on request.

Bilhuber-Knoll Corp. Orange, N. J.

JOURNAL
AMERICAN ASSOCIATION OF NURSE ANESTHETISTS
VOLUME XVIII
1950
INDEX
of
SUBJECTS AND AUTHORS

A

Aberg, Harriet: Two case reports on anesthesia and surgery for Ludwig's angina (note), 194 f.

Accreditation of schools of anesthesia, 144, 146

Adams, R. C.: Balanced anesthesia and supportive therapy, 174 ff.

Albumin, serum, for alleviation of cerebral edema, 86, 178, 188

Alcohol glucose solution, 188

Allergy, anesthesia for patient with (abstract), 57

Anemia, preoperative correction of, 155

Anesthesia: balanced, 174 ff.; complex medical problems in relation to, 101 ff.; complications of, management, 87 ff.; insufficient, as legal problem, 50; legal position of, 44 ff.; for paraplegic patient (abstract), 286; for prolonged surgery, 23 ff.; psychiatric aspects of, 270; service in the United States for 1949, analysis of, 261 ff.

Anesthetics, flammability of, 27

Angina, Ludwig's, anesthesia and surgery for, 194

Anoxia: cerebral manifestations of, 84 ff.; and postoperative urinary suppression, 160 ff.

Apparatus: arm rest and stand for intravenous administration of pentothal sodium (note), 49; "butterfly" (note), 122; drapery hook (note), 123; gadget for separate administration of pentothal sodium and curare, 187; polythene needle, 187; polythene tubing, 185; Rand-Wolfe respirator, 11 ff.

Asphyxia, 168 ff.

Asthma and anesthesia, 183

B

Babcock, Kenneth B.: The hospital's dilemma, 35 ff.

Baird, Lillian G.: Practical nurses and postanesthesia care (opinion review), 6; the question of accreditation (opinion review), 146

Bean, Verna E.: The question of accreditation (opinion review), 146

Boggan, Alberta: Night call (opinion review), 224

Book notices: Anesthesia Abstracts, 292; Clinical Uses of Intravenous Procaine, 213; Fundamental Considerations in Anesthesia, 135; Fundamentals of Anesthesiology for the Nurse Anesthetist, 213; Groves and Brickdale's Textbook for Nurses, 214; Gynecology and Gynecologic Nursing, 136; History and Trends of Professional Nursing, 292; Introduction to Human Anatomy, 62; Methods of Teaching in Schools of Nursing, 62; Mitchell's Pediatrics and Pediatric Nursing, 135; Nursing History in Brief, 214; Physiological Basis for Oxygen Therapy, 292; Professional Adjustments, 292; Psychology and the Nurse, 213; Resuscitation and Anesthesia for Wounded Men, 135; A Review of Nursing, 62; Sociology with Social Problems Applied to Nursing, 62; Vocational Nursing for Home, School and Hospital, 62

Bunge, Helen L.: Role of universities in the education of nurse anesthetists, 39 ff.

C

Cesarean section, anesthesia for, 174

Chest: anesthesia with use of cautery for operations on, 191; complications during operations on, 93, 251 ff.

Children: curare for, 21; fear and anesthesia, 98 ff.; pentothal sodium for, 193; premedication for, 179, 184

Cocaine poisoning, 91 ff., 151

Convulsions: cause and treatment of, 87 ff.; procaine, 151

Costello, Mary A.: Practical nurses and postanesthesia care (opinion review), 4

Courtney, Mabel E.: Practical nurses and postanesthesia care (opinion review), 4
Crotty, Rosella: Obstetric anesthesia (opinion review), 226
Crush syndrome, 160 ff.
Culp, Ormond S.: Postoperative urinary suppression due to anoxia, 160 ff.
Curare: abuse of (note), 122; clinical use of, in anesthesia, 18 ff., 78 ff.
Curreri, A. R.: Fluid administration for the surgical patient, 237 ff.

D

Dehydration, correction of, 156 ff.
Dextran, 176 ff., 187, 191, 192
Diabetes and anesthesia, 182

E

Eclampsia, use of procaine in treatment of, 154
Effler, Donald B.: Complex medical problems in relation to anesthesia, 101 ff.
Ernstene, A. Carlton: Complex medical problems in relation to anesthesia, 101
Explosion hazards: control of, 30 ff.; in operating and delivery rooms, 26 ff.
Eye, enucleation of, anesthesia for, 183

F

Fife, Gertrude L.: Anesthesia for the psychotic patient, 256 ff.
Fluids: administration during operation, 180; preoperative and postoperative administration of, 155 ff., 237 ff.
Fractures, use of procaine, 153

G

Gastrointestinal tract: anesthesia for operations on, 25, 230 ff.; complications during operations on, 96
Genskow, Gertrude M.: Use of electromechanical respirator in cardiac surgery, 11 ff.
Geriatric anesthesia, 244 ff.
Gillette, Shirley M.: Geriatric anesthesia, 144 ff.
Gray, John S.: Oxygen lack, carbon dioxide excess, and asphyxia, 168 ff.

H

Haas, Minnie V.: The question of accreditation (opinion review), 144
Hale, Donald E.: Complex medical problems in relation to anesthesia, 101 ff.
Hayt, Emanuel: Anesthesia comes of legal age, 44 ff.
Heart: anesthesia for patients with cardiac disease, 182; failure, mechanisms precipitating, in thoracic surgery, 251 ff.; use of electromechanical respirator in surgery on, 11 ff.; use of procaine to diminish cardiac irritability, 151 ff.
Hiccoughs, prevention and treatment of, 178
Holmes, Edith Helen: Practical nurses and postanesthesia care (opinion review), 6
Hospital: liability for neglect to install sideboards, 50; private, liability for injury to patient, 196
Hyperventilation, 170
Hypoventilation, 170, 172
Hudenburg, Roy: Standards for anesthetic explosion control, 30 ff.

I

Insurance, liability, 47
Intervertebral disk, ruptured, use of procaine in diagnosis, 153

J

Jactitation, 189

K

Kelly, G. Dan: Pentothal sodium, *d*-tubocurarine, and nitrous oxide-oxygen in a 50-50 per cent mixture (note), 279
Kidneys: comparison of effects of ether and cyclopropane on (abstract), 130; lower nephron nephrosis (abstract), 286; postoperative urinary suppression due to anoxia, 160 ff.

L

Lamb, Helen: Management of certain complications that occur during anesthesia, 87 ff.; The question of accreditation (opinion review), 144
Laryngospasm: 94; treatment of, 180
Lundgaard, Martha: Practical nurses and postanesthesia care (opinion review), 6
Lundy, John S.: Balanced anesthesia and supportive therapy, 174 ff.

M

Margison, Mathilda M.: Practical nurses and postanesthesia care (opinion review), 74
Mastectomy, radical, anesthesia for, 24
Mathwig, Margaret L.: Children's fear and anesthesia, with emphasis on "white syncope," 98 ff.
McCullagh, E. Perry: Complex medical problems in relation to anesthesia, 101 ff.
McQuillen, Florence A.: Cerebral manifestations of anoxia, 84 ff.

Mecostrin, 82
Metubine iodide, 21, 82
Myanesin, 82

N

Nephrosis, lower nephron, 160 ff.
Night call (opinion review), 224
Nurse anesthetists: and administration of anesthetics, 45; and administration of spinal anesthesia, 179; education of, role of universities in, 39 ff.; legality of submitting bills, 51; liability in injury to patients, 124
Nurses: practical, and postanesthesia care (opinion review), 4, 9, 72, 74; registration of, penalties for failure to re-register, 196

O

Obstetric anesthesia (opinion review), 226
O'Day, Exire: Abuse of curare (note), 122
Operating rooms, standards for anesthetic explosion control, 30 ff.
Oxygen, ventilation equivalent for, 169

P

Paulson, John A.: Anesthesia for surgical procedures for intestinal obstruction, 230 ff.
Pendergrast, William J.: Preoperative and postoperative fluid therapy, 155 ff.
Pentothal sodium: arm rest and stand for intravenous administration of (note), 49; rectal administration of, 190; for thoracic operations, 181
Periston as plasma substitute, 176, 187
Plasma, substitutes for, 176 ff.
Pleune, F. Gordon: Psychiatric aspects of anesthesia, 270 ff.
Postanesthesia room, 192
Procaine, intravenous, 150 ff.
Proteins, plasma, correction of deficiencies in, 156, 158
Psychiatry and anesthesia, 270 ff.
Psychoses, anesthesia for patients with, 256 ff.

R

Rand-Wolfe respirator, 11 ff.
Respiration: disturbances of, 170; failure of, mechanisms precipitating, in thoracic surgery, 251 ff.; functions of, 168 ff.
Respirator, electromechanical, in cardiac surgery, 11 ff.

S

Salt, postoperative intolerance of, 159
Schierman, Ruth E.: Anesthesia for prolonged surgery, 23 ff.
Schram, Opal M.: Clinical use of curare in anesthesia, 78 ff.
Shafner, Mary A.: Practical nurses and postanesthesia care (opinion review), 74
Shock, treatment of, 158
Shupp, Miriam G.: Use of electromechanical respirator in cardiac surgery, 11 ff.
Sister Rudolpha: Arm rest and stand for intravenous administration of pentothal sodium (note), 49; Obstetric anesthesia (opinion review), 226
Spinal anesthesia, complications of (abstract), 209 ff.
Spinal cord depressant drugs (abstract), 130
Status lymphaticus, 98 ff.
Stomach, dilatation of, during operation, 179
Sympathectomy, anesthesia for, 23
Syncurine, 21, 82

T

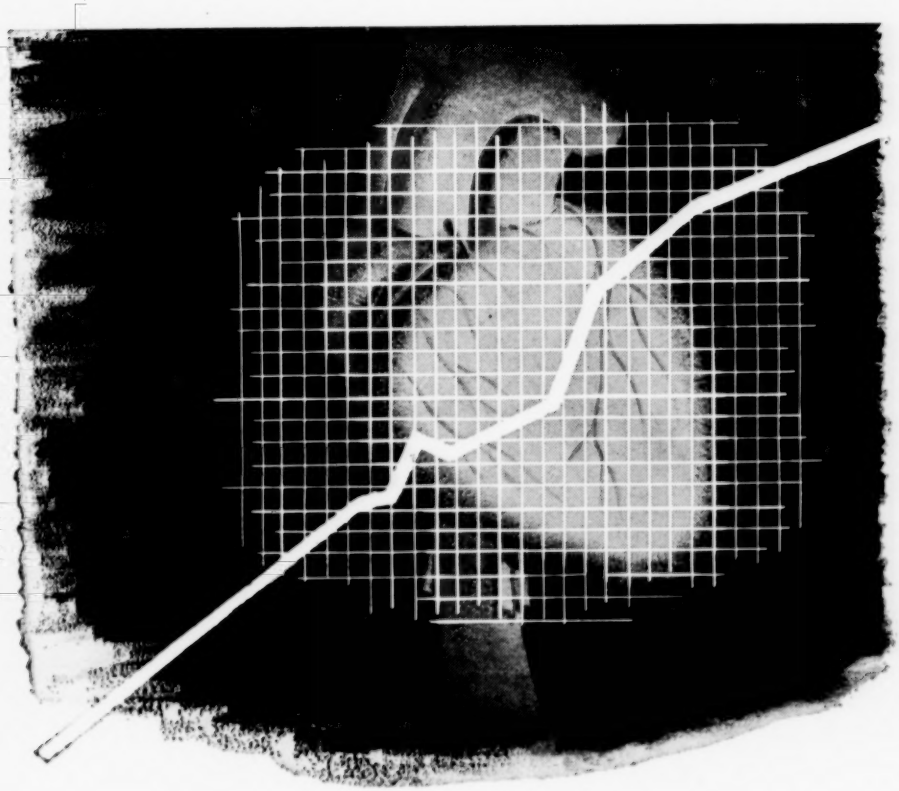
Taylor, Robert D.: Complex medical problems in relation to anesthesia, 101 ff.
Thatcher, Virginia S.: Analysis of anesthesia service in the United States for 1949, 261 ff.
Thomas, George J.: Explosion hazards in operating and delivery rooms, 26 ff.
Tonsillectomy, anesthesia for, 183, 184
Transfusions, 177; of cold blood, 193; with glucose solution, 192; of incompatible blood and lower nephron nephrosis, 163, 167
Trauma, use of procaine in treatment of, 154
Tripp, P. J.: Pentothal sodium, *d*-tubocurarine, and nitrous oxide-oxygen in a 50-50 per cent mixture (note), 279
Tuberculosis and anesthesia, 182
Turner, Charlotte: Clinical observations on use of curare in anesthesia, 18 ff.

V

Van Arnam, Barbara: Mechanisms precipitating terminal cardiovascular and respiratory failure in thoracic surgery with case report, 251 ff.
Van Arsdale, Myra: Analysis of anesthesia service in the United States for 1949, 261 ff.
Veilleux, Martha M.: Intravenous use of procaine, 150 ff.
Vinbarbital sodium for obstetrics (abstract), 58

W

Waugh, John: Balanced anesthesia and supportive therapy, 174 ff.
West, Alva: Practical nurses and postanesthesia care (opinion review), 72
"White syncope," 98 ff.
Williams, Sina B.: Night call (opinion review), 224



***Oxygen** has taken its place among the props for the failing heart*

"Oxygen Therapy in Heart Disease," a motion picture for physicians, has been produced by LINDE in collaboration with the American Heart Association, and has been accepted by the Committee on Medical Motion Pictures of the American College of Surgeons. Showings for medical groups can be arranged by calling or writing any LINDE office.

THE LINDE AIR PRODUCTS COMPANY
Unit of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: Dominion Oxygen Co., Limited, Toronto

Linde OXYGEN U.S.P.

The term "Linde" is a trade-mark of The Linde Air Products Company

Buy

OHIO

MEDICAL GASES

LEADERS For over a half century Ohio Chemical has pioneered in progressive research and manufacturing methods for the production of Ohio Medical Gases.

PURITY Ohio developed the improved purification processes that brought several of our modern anesthetics to present standards. Ohio was first to deliver clean, inspected cylinders sealed against tampering and dust.

SAFETY Now Ohio provides new protection against leakage with its new, specially formulated nylon valve seats and tough, self-sealing Teflon valve packing.

SERVICE For speed, convenience, and reliability of delivery, Ohio Medical Gases are outstanding. For greater convenience and economy, all eight gases are delivered in all standard size cylinders from the nation's principal cities.

CYCLOPROPANE

NITROUS OXIDE

ETHYLENE

OXYGEN

OXYGEN-CARBON DIOXIDE

HELIUM-OXYGEN

HELIUM

CARBON-DIOXIDE

Write for Booklet 241 listing free articles on inhalation anesthesia by leading authorities

Ohio Chemical

OHIO CHEMICAL & SURGICAL EQUIPMENT CO.
A DIVISION OF AIR REDUCTION COMPANY INCORPORATED
1400 E. WASHINGTON AVENUE • MADISON 10, WISCONSIN

Branch offices in principal cities. Represented on the West Coast by Ohio Chemical Pacific Company, San Francisco; in Canada by Ohio Chemical Canada Limited, Toronto, Montreal; internationally by Airco Company International, New York City.